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NATIONAL AND STATE ASSOCIATIONS.

THE proceedings of our own State Teachers' Association fill nearly the whole of this number of the JOURNAL; the next could easily be filled by publishing therein, in full, the proceedings of the recent meeting of the National Association, held at Elmira, New York. We hardly think we shall do this, however, but give instead from time to time extracts from the most important papers read, and statements of the points of most practical value made in the several discussions. Thus our readers will have the wheat without the chaff. We propose here to make a few general remarks concerning both the National and State Associations:

THE NATIONAL.

Better conceived or more complete preparations were probably never made for the reception and accommodation of an educational body than those made at Elmira. What is most unusual, we did not hear a single word of complaint from any one concerning the arrangements made by the local committee, from the beginning to the end of the meeting. If its members could patent the process used, its sale would enrich them all, but unfortunately for them in a money-making way, big hearts, wise heads, and willing hands are not patentable.

Previous meetings of the Association may have been more largely attended by citizens of the locality in which they were held, but the number of persons interested in education coming from a distance to attend the meeting, and the number actually enrolling themselves as members, were greater at Elmira than ever before. All the states were represented except Delaware, Alabama, Minnesota, Kansas, Nevada, California, and Oregon. Our own state was more largely represented than any other except New York. We had present superintendents, directors and teachers of public schools; college men, normal school men, and academy and high school men. In this respect, however, our delegation was in no wise different from others. Never before, probably, was there so complete a union in one body of the representatives of the diverse educational interests of the country. And all was harmonious. The presidents of colleges and the teachers in primary schools sat side by side on equal terms, and found themselves engaged in a common cause and belonging to a common brotherhood.

The papers that produced the strongest current in the thought of the Association were that on a "National University," by President Eliot, of Harvard University; that on "Refunding the Chinese and Japanese Indemnities," by Edward Shippen, Esq., of Philadelphia; that on "Upper Schools" by Dr. James McCosh, of Princeton; that on "A Liberal Education for the Nineteenth Century," by Prof. W. P. Atkinson, of Boston, and that on "Training Schools," by Miss Delia A. Lathrop, of Cincinnati. We shall give abstracts of these papers hereafter, and, perhaps, have something to say editorially of the ground taken by their authors. None of

the views advanced received the formal endorsement of the Association except that a resolution was passed expressing the opinion that the proceeds of the public lands should be set apart for educational purposes in the different states. The following extract from an editorial in the Elmira *Advertiser* is a fair statement of the impression left by the Association upon disinterested spectators:

The meeting of this body of men from twenty-nine States of the Union will be an event long to be remembered in the annals of our city for many reasons. It brought hither many of the most distinguished educators in the country, not only those interested in the public and free schools, but also those from the higher schools and colleges. As Prof. Wickersham said in one of his speeches, there can be no real antagonism between those who are doing right, and it follows that between these two grades or classes of schools there can be no antagonism, and should be the heartiest co-operation. They are all interested in the same great cause of education. Among the results of such gatherings, this must surely follow, that every section of our country will be more firmly cemented in feelings, thought and purpose to every other section. These gentlemen and ladies have in their hands the moulding of the minds and sentiments of the future men and women of the Republic, and when they meet as they have here met, with such unanimity of purpose, with such cordiality of feeling, and such a brotherly sentiment prevailing, what else can be predicated of the pupils under their charge? than the same cordial good-will towards one another. This perfect good feeling of the Association must have been clearly manifest to any one who has attended with any degree of regularity the various sessions, and it was one of the pleasantest of the many pleasant features of the meetings.

THE STATE.

Detained at Harrisburg by public business, we spent but a single day, Thursday, in attendance at the meeting of the State Teachers' Association at Pittsburgh. We were there long enough, however, to breathe its spirit and become a part of its life.

In numbers, considering all the circumstances, the meeting was a success. The number attending from Eastern Pennsylvania would have been at least doubled, if the report had not been circulated that the cholera had appeared in Pittsburgh, and the wet weather kept multitudes at home in all parts of the state. Notwithstanding these adverse causes the enrollment reached four hundred and sixty-seven. The large hall in which the Association met, seating some fifteen hundred persons, was well filled at nearly every session. The arrangements made by the local committee were excellent. The hall was well suited to the purpose of such a meeting, members were well accommodated at the different hotels and boarding houses, and the excursion by steamboat down the Ohio river as far as Dixmont was greatly enjoyed by those who participated in it. The continued wet weather prevented the contemplated visit to some of the manufacturing establishments of which Pittsburgh has so much reason to boast.

An unusual number of gentlemen appointed to read papers and make reports to the Association, failed to appear. In several cases no very good reason was given for absence. This neglect of duty is very annoying to the officers responsible for the management of the Association, and unjust to the Association itself. But, fortunately, those present on this occasion were quite equal to the emergency, and the gaps in the programme were well filled up by extemporised discussions and addresses. Indeed, we are inclined to think that these were among the best features of the meeting.

It nearly always happens at these meetings that some one or two subjects assume greater prominence than others, and, creating a strong current in the mind of the body, draw into it the discussions arising upon all other questions. The Pittsburgh meeting was no exception to this rule. The two topics that called out the most earnest and able discussion were that of Dr. Wood, on the "Conflict between Science and Theology," and that of Prof. Brooks, on "What can our Schools do to Quicken the Public Conscience?" supplemented by the address of Prof. Cook on "Moral Instruction." The discussion on the first-named topic, participated in by Mr. Burtt, Profs. Brooks and Waugh, and Drs. Cattell and Hays, was pronounced, by competent judges, one of the ablest that has ever taken place before the Association. We ourself heard the excellent papers of Profs. Brooks and Cook on moral instruction, and their timely and impressive presentation of the subject produced an effect that will not soon be forgotten The discussion that followed was not prolonged, but it was earnest, and we are much mistaken if all thoughtful minds present did not feel deeply the necessity of the introduction of some better methods in our schools of rooting out vice and inculcating virtue. How the needed work can best be done is still an unsolved problem. Who is able to solve it?

The Association elected competent and deserving men to fill its offices for the coming year. They will perform their respective duties faithfully; but while the plan has

some advantages, we regret to see so many of them located so near together. We have always thought it wise to scatter the officers of the Association over the state, in order that the interests and differing views of all parts of it might be represented. Accidents of this kind, however, will happen if not carefully guarded against.

We feel it right to add that much of the success of this meeting is due to its presiding officer, Dr. Geo. P. Hays, President of Washington and Jefferson College. Ready, cool, fair, prompt, clear-headed, fertile in expedients, and full of fun, Dr. Hays is a model presiding officer, and the Association very properly voted him a special resolution of thanks for his services.

The next meeting of the Association was fixed at Shippensburg, Cumberland county. The plan is to occupy the buildings of the State Normal School at that place, which, it is said, will accommodate five hundred persons. There are also several hotels in the village, which will accommodate a considerable number in addition. It is expected that the social advantages of this meeting will be greater than those of any one heretofore held, and we have no doubt that the programme of exercises will be at least up to the usual standard of excellence. Prepare, therefore, to be at Shippensburg next August.

TWENTIETH ANNUAL SESSION.*

THE Twentieth Annual Session of the State Teachers' Association of Pennsylvania was called to order at 10 o'clock, A. M., on Tuesday, August 12th, 1873, in Library Hall, in the city of Pittsburgh, by Prof. Charles H. Verrill, chairman of the Executive Committee.

Opened with prayer by Dr. George P. Hays, and singing of long-metre doxology.

The chairman announced that the President, Edw. Gideon, esq., of Philadelphia, would not be able to attend the session, on account of serious illness in his family. He therefore called upon the first Vice President, Rev. George P. Hays, D. D., President of Washington and Jefferson college, to assume the duties of the chair.

Dr. Hays took the chair, expressing regret for the cause of the President's absence, and also for the loss of his experience and familiarity with the management of deliberative bodies. He would, however, do the best he could.

Prof. Verrill gave directions to the enrolling committee as to the manner of preforming their duties.

Mr. W. R. Ford, of Pittsburgh, principal of the second ward schools, and chairman of the Local Committee, then delivered the following.

ADDRESS OF WELCOME.

To-day we meet to celebrate the twentieth anniversary of the Pennsylvania State Teachers' Association. The pleasing duty of extending to you the hand of welcome has devolved upon me, and in extending to you that welcome, I feel that I am but receiving you in the home of your choice. It was in this city that the Association received its first existence. A fifth of a century has passed since, upon a spot but a short distance from this, the first meeting of the Association was held.

A few progressive teachers of the county, knowing that institutes had been held in the West under the most favorable auspices, and that many had been called in the East, and that teachers were everywhere exerting themselves for self-improvement, felt that a more-extended effort was necessary. In furtherance of this effort, a time and place of meeting were suggested by the teachers of this county. In this suggestion the society of Lancaster acquiesced, and soon the support of the teachers of Philadelphia was added.

On Tuesday, the 28th day of December, 1852, a convention was held in the city of Harrisburg, when Pittsburgh was selected as the place for the first meeting; and without desiring to be egotistical, or to assume to us more than is our right, permit me to quote from the SCHOOL JOURNAL of that date. The Hon. Thos. H. Burrowes, an earnest friend of education, says: "For the part taken in the matter, the Allegheny Society merits the thanks and support of every advocate of general education, and we hope that the call for the convention will be responded to by every county in the Commonwealth." The call was responded to, and since that time annual meetings have been held to further one of the noblest causes that can engage the mind of man, that of the education of the masses. Different parts of the State have been honored by your meetings, and, knowing the great benefits that have resulted, we trust that your return to the place of your birth will give new courage, and that animated by a knowledge of the past, we shall be stimulated to renewed and greater efforts in the future.

In the two decades many who were with us have gone to their reward. They are of the *past*, but their influence is for the *present*, and will extend to the future. The little seed then sown has multiplied abundantly, and to-day Pennsylvania stands unsurpassed, if equalled, in her system of public instruction. The hills and valleys of the State have been invaded by the school-master, and are everywhere ornamented with the school-house. Pittsburgh and her twin sister, Allegheny, have been no laggards in the march; step by step they have pursued their course, and we think we can offer you results of which we need not to be ashamed. Thanks to a generous public, guided and directed by judicious officers, we can present to you buildings and school

*Reported by J. D. PYOTT, Lancaster, Pa.

appurtenances of which we may be justly proud. We invite you to an inspection, and know that you will be encouraged when you learn what has been accomplished by persistent and well-directed effort. Within the past seven years, Pittsburgh alone has expended on school buildings the sum of $857,000. The total value of school property being estimated at $1,394,500. These expenditures and estimated values refer to Pittsburgh as it existed prior to the late consolidation of territory containing 36,000 inhabitants.

As you pass through our city and observe the structures erected for and dedicated to the purposes of public instruction, you will be ready to exclaim, that the people of Pittsburgh have fully realized, that "knowledge is power," and that, to obtain that power, they have poured forth plentifully of their means.

The progress of our schools, as here indicated, is but a reflex of the progress of our city. From a fort and surroundings containing but a few log huts we have grown to a city containing 122,000 inhabitants. The cash value of the real and personal property being $176,147,595. Our productive industries are many and varied. To them are we indebted for our present prosperity, and they hold forth the promises of grand results for the future. In the production of iron, steel, glass and coal, Pittsburgh leads every other city in the Union, but the most important of all its industries is iron and its products, and that you may form a correct opinion, on your visits to our manufacturing establishments, you will remember that, in iron and steel alone, there is invested $26,692,896, and employment is given to 15,541 hands The total consumption of raw iron during the past year was not less than 600,000 tons.

Whilst Pennsylvania holds the proud position of the foremost State in the Union in the production of iron, Pittsburgh has done her full share towards keeping her in the front rank. Another important industry to which your attention will be invited is the production of glass, and this branch of manufacturing is equally illustrative of the growth of the city. Here are to be found fully one-half of all the glass manufactories of the states. The number of hands employed in this branch is estimated at 5,000 and the weekly wages paid for labor is about $60,000. In your visits you will find a soot-begrimed people. To cleanliness of appearance, we can make no pretensions, but beneath uncourtly exteriors you will discover hearts actuated by a generous public sentiment, you will mingle with those who have contributed liberally to the great cause for which you are so earnestly working a cause which they believe will be of great advantage to coming generations.

To the county of Allegheny, whose teachers put forth the first efforts to establish this organization, I bid you welcome. To the city of Pittsburgh, which ranks second to none in the State, in her efforts to advance the cause of education, I bid you welcome, and the facts I have now given must be taken as an earnest of our sincerity. Whilst we cannot boast of the beauty of our city (in that respect we must yield the palm to our sister Allegheny), nor can we offer you any magnificence of surrounding scenery, we can present to you one grand workshop, a school in which all can learn. We invite you to go with us to visit our many manufacturing establishments, to view our workers in iron, in steel and in glass, and in other productive industries which I cannot here attempt to enumerate. We believe such a visit will afford you ample gratification, and fully compensate for pleasures which only delight the eye. Here in the Birmingham, and I may add as well, the Sheffield of America, and we trust in a city destined ere long to surpass those cities of the Old World, in the specialty of their manufactures, you can have unfolded the pages of a volume well worthy your careful study. The arts and manufactures are here fully illustrated, and you may learn and carry with you to your schoolrooms lessons which will be of interest to yourselves and of profit to your pupils. You can see the practical applications of what perhaps have been hitherto but pleasing theories. You can here realize the triumph of mind over matter. Whilst observing the skilled artisan manipulating the material, you will be led to discover the importance of the study of those laws by which all is directed.

When you observe the many labor-saving machines you will then truly realize the power of intelligence, and the great results that have arisen from education. You will see that it is fitting for our people to be lavish in the supply of means to give that knowledge which must result not only in the perpetuation of their power, but also in its vast and continued increase.

In the name of the teachers of Pittsburgh and Allegheny, I thank you for coming amongst us and assure you that they will endeavor to make your visit one of pleasure to you, and we trust it will be one of profit to us. By your deliberations we expect to be benefited. We look for an awakening of a still greater interest among our people, We hope that a stimulus may be given producing further and more extended efforts in behalf of our youth, that they may become intelligent and industrious citizens.

We trust that from your efforts the people of this city will be led to feel, that it is not only their duty but their privilege to give their influence, as well as their means, to continue and extend this educational system and thus will they realize that their money will be converted into intelligence and virtue in the minds of those in whose society they and their children must expect to live.

I welcome you, because, as an intelligent people, we must welcome every movement which looks to the elevation of individuals of whatever class, and which tends to increase the welfare of the community, We welcome you as an Association in which we claim a special interest, an organization comprising those who, by their chosen profession, sustain a near and important relation to the public welfare—persons whose intelligence and mental culture have a professional as well as a personal connection with the advancement of society.

To you, sir, as chairman of the Executive Committee, I now give place. In your endeavor to conduct the business of this Association, you will command the services of the teachers of this city, with the assurance of a hearty co operation on their part, with the rendering of a willing obedience, and a determination to promote the interests of this Association, and to make this one of the most successful meetings yet held in the State. Thus will your mission be accomplished and our desires gratified.

Prof. Verrill responded briefly. Even if the kind words of the chairman of the Local Committee had been left unspoken, we should have known that we were welcome from the careful preparation made for our

reception and thoughtful provision for our comfort and pleasure. The teachers of Pittsburgh had done well their part toward making the session a success, and he thought the indications were that the attendance would be good. Already we have here represented the State School Department, the colleges, the academies, the normal schools, the public schools and the private schools—all the branches of our common work; and to-day, at the close of the twentieth year of its existence, the State Teachers' Association is a power in Pennsylvania. As the representatives of the educational interests of the State, our proceedings will be watched with careful eyes by the friends, and with even closer scrutiny by those who are *not* the friends of our common-school system. It becomes us, then, to discuss the vital questions of the time with an eye to the future.

In behalf of the executive committee, he would only say that they had endeavored to attend to the duty assigned them, and presented their programme, knowing it would be criticised, but consoled by the fact that their places on the committee would soon know them no more.

To the local committee, and the teachers of Pittsburgh and Allegheny, he again returned his thanks for all that they had done, and all that they promised to do for our comfort, and hoped that when the session closed we should all have been both pleased and benefited by our session at Pittsburgh.

Mr. H. B. Whittington, of Philadelphia, made some remarks relative to conducting the election for officers of the Association. This matter, he said, had been run by "rings" at Philadelphia and Williamsport, in a manner that he considered disgraceful. He would, therefore, offer a resolution in the nature of an amendment to the by-laws, which he believed would remedy the evil. The resolution is as follows:

Resolved, That a committee of three be appointed to conduct the election of officers of the Association, the polls to be opened one entire session. It shall be the duty of the election officers to make a list of all members of the Association voting, and no vote shall be received unless the member offering the vote shall present his or her card of membership.

Mr. S. D. Ingram, of Harrisburg, hoped the motion would not prevail at this time. If the difficulty is that people vote who are not members, how are we to know who votes on this question, before any enrollment has been made? He called for the reading of the Constitution and By-Laws.

They were read by the acting secretary.

Mr. A. T. Douthett, of Allegheny, moved that further action on the resolution be postponed for the present and that we proceed to enrollment of members.

The motion was agreed to, and a recess was ordered for the purpose of enrollment, when the committee proceeded to take the names of those present.

At noon the Association was again called to order, and a solo was sung by Prof. R. M. Cargo, instructor in vocal music in the Pittsburgh schools.

Dr. Hays then, in the absence of the President elect, and instead of the usual inaugural address, read a paper on the subject of Every-Day Logic.

EVERY-DAY LOGIC.

BY GEO. P. HAYS.

Ladies and Gentlemen:—By the partiality of your Executive Committee, I was invited to make one of the evening addresses at this meeting. In accepting that invitation, I decided to speak to you on the subject of Every-Day Logic, believing that no part of the education of children, is more fundamental than that which taught them, not the results reached by others, but how to reach correct results for themselves. When, then, I was notified by the proper officers, that, owing to illness in his family, your President-elect would not be here, and that I would therefore be called on to preside, it seemed to me, that the discussion of that same theme would not be out of place even on such an occasion as this. Being only a Vice-President, and not elected President, such a discussion as might be proper under other circumstances would seem now to be scarcely proper. You will allow me, therefore, to take up this, which may seem to be perhaps a topic only incidentally connected with education.

Can I be mistaken as to the vast importance of this matter of correct reasoning? It is the method, by which, from what we know, we decide what we will do. Thus there are but two things antecedent to our purposes of life; a knowledge of facts, and reasoning upon them. If, now, either our facts are misapprehended or our reasoning is fallacious, we can hardly hope to go right in life. But we live life only once. We cannot try it again. Of what utmost importance, then, is a right knowledge of facts and right reasoning upon them.

I take it that it is not necessary to delay in urging the importance of teaching children to observe carefully. The whole course of school study teaches that. The spelling-book teaches it, by the difficulty of knowing how an English word is spelled, or what it means, by its mere sound. So geography teaches it, for it is mainly a mass of facts. So especially does an object-lesson on any subject teach this, for there is the thing before them, for them to observe and then describe. The importance of teaching children and youth to observe closely and definitely is very generally appreciated both by teachers and the public.

But of not less importance to their after-lives is it, that on these facts they should reason correctly. How ready we are to jump at conclusions from a single fact. Even teachers are liable to this. A slate is broken, and Sarah is seen picking up the pieces and trying to put them together; therefore Sarah broke the slate and must get a whipping. Now, Sarah may not have broken the slate, and if she did, it may not be certain that she deserves to be punished. It may have been unavoidable.

What then are the tests of our conclusions by which we may judge of this reliability.

In the first place, correct conclusions explain and harmonize all the facts. All truth is consistent with itself, so that each truth is consistent with every other truth. So long as any given fact directly conflicts with your theory, it will not do to trust too much to it. False theories may explain some facts, but not all. How many scientific theories have been proposed that offered excellent explanations of many facts, and how many on that account believed them, never thinking that they ought to consider equally other facts just as important and wholly subversive of the theory. It will not do to take some facts and leave out others. All must be included.

The effort of the lawyer in dealing with circumstantial evidence is of just this nature. His task is to show that his theory of the case is borne out by all the facts proved; and it is enough for the defense to show that there are certain facts in irreconcilable conflict with the theory of the prosecution. Just so with you in your search for some mischievious scholar. When you are on the track of the right one, every fact points just the same way, and as a whole identifies the same person. The problem of the scientist is just the same. He is searching for a theory by which all the facts with which he deals may be harmonized and explained. Many a scientific theory is accepted, simply because it best explains all the facts connected with the subject.

Then, there is another difference between true and false conclusions, to which I ask your attention, which is this, that, with incorrect theories, each new fact seems to demand some new complexity for the theory. Thus, in the conflict between the Ptolemaic and Copernican theories of the heavens, with the Ptolemaic each new fact or motion of the planets demanded a new motion to be supposed, which they called an epicycle, and so they were compelled to keep on, adding epicycle upon epicycle, until all seemed confusion. When, however, the Copernican theory was proposed, the complex motions, instead of demanding increased complexity in the theory, were seen to be the natural result of the theory. So in the matter of light, the theory of rays explained reflection very well, but it became complicated, when called to explain refraction and polarity, while the vibratory theory of light equally well explains reflection, and with wonderful clearness accounts for refraction and polarity. You may have found the same thing when on search for the author of mischief. While you had it fixed on the wrong boy, every new fact found out about it, made it more difficult to explain, but when you fixed it on the right boy, every fact only made it more and more evident that you were right.

This leads me to still another peculiarity about correct conclusions, namely, that they seem to demand facts heretofore unnoticed. Thus the Copernican theory, when at first proposed, was met with the fact that, if it was true, Venus ought to show phases like the moon. But no such phases were seen. When, however. more powerful telescopes revealed the fact that Venus does show phases like the moon, you can readily see how strong a confirmation that was of the theory. So when Newton suggested the doctrine of attraction, it was evident that if that was true, all the planets would be more or less affected by their proximity to other planets in the heavens, and by and by the increasing power of the telescope revealed just such perturbations. Indeed, the very existence of the outermost planets was first revealed to astronomers by the divergence of the next planet from its direct orbit, and, when observing the amount and direction of that divergence, and then calculating the size of the yet unseen body, they found it by turning their most powerful telescopes there, it was one of the strongest possible proofs of the correctness of the theory. First, the known facts demand the theory, and then the theory demands still other heretofore unobserved facts.

And this brings me to recall your attention to a point already made; to wit, we must include all the facts. It is not enough to explain some, we must explain all. Four-fifths of the skepticism of the world comes from just this method of leaving out of view some of the facts. If we leave out of view man's moral and mental nature and history, and a good many other things, it is not hard to get up a theory of nature without a God; but include all the facts, and no theory will answer that does not admit an over-ruling deity.

I pass on to the other test of the correctness of our conclusions, and the one to which scientific men have come as the most certain test of all, namely, the power to predict the future. Why do we so fully believe in the correctness of the astronomer's theories? Because at the beginning of each year, we buy an almanac, and it tells us when the sun will rise each day, how many eclipses there will be, and how large, and whether they will be visible here or not. We are now seeing a science grow up under our eyes. When some years ago the great United States Government proposed to appoint a man to predict the weather, we thought it must have but little to do. We remembered how often, as children, we had been cheated by the weather prognostications in the old almanacs, and supposed this would turn out the same way. But, by and by, we noticed that when the daily paper brought a "probability" of rain, men took their umbrellas to the store. That was a testimony to its truth that could not be doubted. These men probably never said to themselves," Prediction is a proof of truth," but unconsciously they acted on that principle; and now when it is ascertained that more than fifty per cent. of these "probabilities" are completely verified, and another large percentage are in the main fulfilled, and that not more than ten or fifteen per cent. fail, we cannot doubt but that there is a science there. The mercantile interest, and especially the shipping community, understand its value. The man who is at the head of that weather bureau, though comparatively a young man, has surely justified his claims to his position.

Few things seem to be more wonderful than the exactness with which astronomical predictions are fulfilled. A few years ago a friend and myself went down to Louisville, Ky., to witness the total eclipse of the sun. On the bluffs below New Albany, Indiana, we found a company with instruments for taking observations. Among others there was Prof.

Campbell, of Wabash College, who had set his watch to Washington City time, and there, within a few minutes of the time predicted for the first contact of the shadow, the straightening of the line of the sun's disc was perceptible. When the time for the total obscuration had nearly arrived, as we looked up a valley towards the northwest, we could see the dark shadow sweeping towards us, and just at the promised moment the sun's light was lost to our view, and there in the heavens—shadow, corona, red protuberances, and all—was the sight we had come to see. How marvelous that, with such accuracy, men could predict the precise places of two such immense moving bodies as the sun and moon! Is it any wonder, then, that we have confidence in the astronomical theories which receive such verification?

As I have already alluded to the relations of science and religion, I may here refer to it again. It is said that Christians do not prove Christianity as science proves its truth. But the Bible is built up exactly as an inductive science is built. It first offers its facts without any theory in the historical books, and after that offers its theories in the doctrinal and devotional, and then tests itself by its predictions. It is surely most illogical for any one to assert the truth of science, because it can predict the future, and yet deny that the fulfillment of its prophecies proves the Bible true. Every test of scientific inductions justifies our faith in the teachings of Scripture.

I pass from this region of science to your everyday life in the school-room, for I wish to show you that these highest efforts of the human mind are identical in kind with those of the humblest thinkers. You are studying the character of scholars; you make up your mind from all the actions which you have seen in them; and then when circumstances call them out, you judge that they will act thus and so, and you are satisfied with the correctness of your conclusions, when you find them fulfilling your expectations. Just so will they judge of you. Your every act goes in to help them make up their minds. If you try to impose your ignorance on them for wisdom, they will agree to put you to the test, and will see through the old dodge of your asking them all to take that hard question for to-morrow; and when they get out of your sight they will laugh and say, "I told you the teacher couldn't answer that question." Of precisely the same character is the exultation of the scientist, when, in his laboratory, he imagines that the effect of mixing certain compounds will be thus or so, and finds his expectations justified by the result.

The rules and tests of reasoning are not a set of artificial methods invented to help the mind think. They are rather its natural, or, I should say, its instinctive habits of thinking. Just so a man's instincts sometimes control him. When he falls into the water, he does not stop and bethink himself that the right thing for a man to do is to try to swim by striking out with his hands and feet; but, before he knows, he is trying to swim "for dear life." So these are the instincts of our mental habits. Men have not invented the laws of numbers. They count by nature, but it is a great help to have the rules. So here, in reasoning, it is a great help to have the rules by which we may be guided.

And now, fellow teachers, we have gathered together here for this very process. We bring the various facts of our several experiences together to draw from them our methods of instruction. It cannot but be of the utmost value thus to compare views, and so correct mistakes and rectify errors. And this is one great benefit of this and similar organizations, such as teachers' institutes. Here you may get new suggestions, facts and plans, which you can take back to that wonderful mental laboratory you have in your school-room and experiment upon. You will then be able to prove that which is good, and will learn relentlessly to throw away that which is unsound.

I congratulate you upon these opportunities for mutual improvement and upon the range of subjects here to be discussed. I trust that we shall all enter into this meeting resolved to contribute our share toward the general information of all. We are exhorted to renewed zeal, diligence and fidelity, by the greatness of the work we have in hand, the greatness, and solemnity of the influences which we wield, in the young people we are educating, and by the greatness, solemnity and sublimity of the field of labor in which we operate, as we mould the sentiments of coming gene rations while they pass under our care. Happy shall we be, if we worthily labor in such a work, a work which has filled the hands, and occupied the talents, and received the most earnest attention and effort, of some of the best men with whom God has blessed the earth.

The vacancy caused by the promotion of Dr. Hays was filled by the election of Hon. H. C. Hickok, of Philadelphia, to be first Vice President.

On motion of Prof. A. Burtt, of Pittsburgh, the committee on the enrollment were authorized to issue certificates of membership. J. Fletcher Sickel, of Philadelphia, was added to the committee.

Adjourned to 7½ o'clock P. M.

TUESDAY EVENING.

OPENED at half-past seven o'clock, when the following appointments upon standing committees were made to fill vacancies.

Executive Committee—Prof. Lemuel Amerman, Montour, and Supt. W. N. Aiken, Lawrence.

Committee on Enrollment—John Morrow, S. A. Will and D. R. Brubaker, Pittsburgh, and J. F. Sickel, of Philadelphia.

Mr. John Morrow, Pittsburgh, was appointed Treasurer *pro tem.* in the absence of Mr. D. S. Burns.

The President remarked that at Elmira a list was opened for "Teachers' Places," upon which a number of names were entered.

It was moved by Prof. Beard that a committee of three be appointed on Teachers' Places. Agreed to, and the following were appointed: Messrs. D. E. Kast, J. C. Graham, and D. B. Brunner.

Prof. B. C. Jillson, principal of the Pittsburgh High School, read a paper on the Physical Features of the Mississippi Valley.

THE PHYSICAL FEATURES OF THE MISSISSIPPI VALLEY.

BY B. C. JILLSON.

In the great plan which Nature has devised for carrying on the functions of the earth in an exact and economical manner, rivers play an important part. They carry off the surplus waters from the surface—they mix the soil of one country with that of another—they fertilize their shores—they serve as a habitat for animals, and, in many cases, afford an easy and safe communication for man, or suitable opportunities to labor for his profit and benefit.

Nature is a great economizer. In her operations nothing is lost. Though she pulls down here, she builds up there. The materials upon which she works are not destroyed, but moulded into other forms. By judicious labor upon a few elements she produces great and varied results. The rain-drops as they fall from the heavens, not only water the plants but, by their solvent power, provide also sustenance for its roots; then finding their way through the brooks and rivers to the ocean, rise by evaporation, forming clouds, which, carried inland by the winds, are again precipitated in gentle showers The dashing waves of the ocean wear away the granite rock-making great inroads in the land, and by their mighty power seem destined to devour the solid earth itself. But the ravenous nature of the ocean is counter-balanced by the silent though no less mighty influence of the rivers.

The little particle of rain, the glistening dew-drop, and the fragile snow-crystal, exert an influence upon the rock-ribbed hills. Each seizes a particle of solvent material and hurries with it to the ocean. Borne by the winds, dashed by the waves, or carried hither and thither by the currents, they form shoals and sand-bars; or, perhaps, are used by the little polyp for building up the beautiful coral islands; so that the limestone particle, born in the interior of a continent, is made to act an important part in the island of mid-ocean. The disintegrating and erosive power of running water is still more evident. The ice-wedges of winter force off huge blocks from the cliffs; the running water rolls and tumbles them about, polishing their sides, wearing away the rough corners, and, reducing them in size, bears them to the ocean. Thus, the solid earth and liquid sea are constantly warring, the one with the other, and thus is Nature, by simple means, equalizing their labors. The size and direction of rivers are determined by the great mountain chains. These have not been thrown up promiscuously, as might, by a cursory glance, be supposed, but take form and direction according to fixed laws. Not only are the rivers influenced by the mountain chains, but the outlines of continents, and the direction and advance of civilization, with all its attendant blessings, have been in the same manner determined. Had, for example, the lofty Rocky Mountains, and the comparatively low Appalachian chain exchanged places, what a check would have been given to the westward advance of the "Star of Empire!" The Mississippi would have emptied into the Pacific, and our fathers, prevented from further advance by the impassable mountains, would have been confined to the narrow strip of land between it and the sea; and the great Mississippi Valley, so rich in mineral and agricultural products, would have been slow in development, and cut off from direct communication with the Old World. Had the slight elevation which divides the headwaters of the Saskatchawan, the Mackenzie, and the St. Lawrence, from our own Mississippi, been a few hundred feet higher, our valley would have had the temperature of the tropics, and British America would have been as bleak and barren as Siberia: while now the cool winds from the Arctic, unobstructed in their southern course, mingle with the warm and moist winds from the Gulf, giving our great valley a mild and equable temperature.

If we examine the large rivers of our globe, we find the one now under consideration more favorably located than any other. The great rivers of Siberia and British America, which empty into the Arctic Ocean, have their mouths closed during the greater part of the year. When spring opens, the source is thawed, and as the mouth is still held firm in icy bands, the mighty torrent rushes over the adjoining plain, carrying desolation in its course. The great rivers of China, as well as the Amazon of South America, flow in an easterly direction, and, through their whole course, each follows closely its own degree of latitude. The Nile is obstructed by cataracts, and, having its source under the equator, annually overflows its banks; but the Mississippi, flowing from North to South through twenty-three degrees of latitude, and, with its tributaries, thirty degrees of longitude, with its mouth unobstructed at all seasons of the year, its rate of flow nearly uniform, and navigable for ten thousand miles, presents us with a model river, differing from all the others, and in every respect nobler and grander than them all.

The Mississippi Valley includes the space between the Appalachian chain on the east, the Rocky Mountains on the west, and the watershed south and west of the great lakes. The average height of its eastern rim is 2,000 feet; of its western, 8,000 or 10,000, while its northern is, at the most, only 1500 feet above the sea. This northern rim is said to be a perfect labyrinth of lakes, and the portage at any season, between the headwaters of the rivers separated by this low watershed, is only a few miles, and, in the spring, boats can easily pass from one to the other. So slight a cause prevented the Mississippi from draining all the northern half of the Western Continent. The area now actually drained by this river and its branches, is estimated to be a little less than two and a half million square miles, an extent of country more than twenty-five times the size of the island of Great Britain, and more than one-half as large as all of Europe.

When this river was first navigated, but little was known of the main stream or its tributaries, and the name Mississippi was unfortunately given to one of the branches, while the parent stream received the distinctive appellation of Missouri. The latter river being the larger, and by its turbid waters giving character to the Mississippi, should have been considered the main stream. The total length of the Mississippi would then be 4,506 miles. It is navigable for steamers a large part of the way at all seasons of the year. In 1859, a steamboat went up the river nearly to the Great Falls, a distance but little less than 4,000 miles from the gulf. When we compare

this river and its tributaries with those of the Old World, how insignificant do the latter appear!

A few years since, while traveling from Paris to Strasburg, the speaker was brought in contact with an Englishman, who, expatiating on London and the Thames, exclaimed with much apparent gratification, "The Thames, the Thames! Why, sir, it is one hundred and fifty miles long!" The following reply, as might have been expected, was sufficient to dampen the ardor of our British friend. "In the western part of the State of Pennsylvania is the city of Pittsburgh. There we see steamers that have come from the oil regions on the one river, or the coal mines on the other, a distance of two or three hundred miles. Taking one of these steamers, we can sail down the Ohio river to its mouth, one thousand miles, and there meet with a steamer which has come from the Upper Mississippi, an equal distance, and another from the Missouri, twelve hundred miles or more, and all three sail down the Mississippi, another thousand miles to New Orleans." When the first thousand miles was mentioned the Englishman gave a start of surprise; at the second, a decided grunt; at the third, a look of contempt; at the fourth, he turned his back, and for half an hour appeared deeply absorbed in contemplation of the scenery from the window on the opposite side of the railway train. If we examine the soil and climate, the fauna and flora of this great valley, we find a marked difference between the northern and southern portions, and the eastern and western slopes In studying the resources and capacities of a country we do not, as in former times, merely measure its height above the sea, and its distance from the equator, but now we examine its physical features; we carefully study its geology; we trace the upheavals which produce the mountain chains, direct the prevailing winds, scoop out the water-basins, guide the brooks and rivers in their appropriate channels, and by the out-crop, giving the soil characteristic of the protruding geological formation. Scanning the surface of our continent we find a depression extending from the Arctic Ocean on the north, to the Gulf of Mexico on the south, and bounded east by the Appalachian chain, and west by the Rocky Mountains. So slight and gradual are the slopes that we might travel from the Gulf to the Arctic Ocean, and from the Appalachian to the Rocky Mountains, and not be aware of a change in level. Crossing this depression near the centre, and dividing it into two parts, is a slight elevation, called the "Height of Land," not sufficiently high to change the direction of the winds, and just high enough to form a watershed, separating the waters of the Arctic Ocean from those which empty into the Gulf of Mexico. The general direction of winds north of the equator, between the Tropic of Cancer and the Arctic Circle, is towards the northeast. The winds from the Gulf of Mexico sweeping unobstructed along the eastern slope of the Mississippi Valley deposit their moisture in copious showers, thus abundantly watering the Atlantic highlands from the Gulf to the Lakes. This region has, therefore, a moist climate, a fertile soil, an abundant vegetation, and teems with animal life. If we cross this great valley to its western slope, we shall find, though at the same distance from the equator, a marked contrast. Its climate is drier and it has very few summer showers, and very little rain at any season. So dry is the climate that decomposition is prevented, and animals that are left unburied dry up without exhaling any odor. The abundant vegetation of the Appalachian chain is here unknown, and the so-called Great American Desert, so conspicuous on our maps, forms a marked feature of this region. Here we find the soil covered in many places with a white alkaline incrustation, which, raised in cloud by the passing traveler, fills his eyes, cracks his lips, parches his throat, and excites a thirst which the water, strongly inpregnated with this same alkali, is not only unable to quench, but is the means of greatly aggravating his sufferings. This desert is devoid of vegetation, except the mountain sage and a few worthless shrubs. This region is also crossed by southwesterly winds. These winds come from the Pacific coast filled with moisture, but in crossing the snow-capped Sierra Nevada and the Rocky Mountains, their moisture is removed, and they fall on the eastern side as dry winds. The whole region is, therefore, generally remarkable for the lack of moisture and vegetation. This is well shown by the fact that the annual amount of water discharged by the Missouri is about three-fourths of that from the Ohio, though the amount of land drained by the former is infinitely larger than that of the latter. Between the dry and treeless western slope and the forests of the moist eastern, is a vast plain with moisture enough to make the soil very fertile, but with trees only on the river courses. This region is called the Prairie, and is covered with tall grass or waving grain.

While the headwaters of the Mississippi and its tributaries are lined with bluffs, in many cases hundreds of feet in height, its banks below the mouth of the Red River are very low. In the spring the river overflows, covering the country for miles, giving it the appearance of a great sea, the outline of the river being distinguished by the half-submerged trees upon its banks. In this warm, southern region, with long summer and a moist climate, cotton and rice, sweet potatoes and sugar-cane, together with many tropical fruits, are extensively cultivated. The Mississippi basin, then, in general, is extremly well-fitted for agriculture by its level surface, rich soil and moist climate, and is undoubtedly, the garden spot of the world. Experiments have shown that even the so-called Great Desert can, by irrigation, be made to bud and blossom as the rose.

If we examine the geological features of the Mississippi Valley, we shall find representatives of all the formations in the geological calendar. Upon the rim which bounds the east, north and south, we find the metamorphic and igneous rocks, while on the bottom and slightly-inclined sides the horizontal layers are arranged in regular order. From the lowest layers of the lower silurian to the uppermost of the post-tertiary hardly a single one is wanting. In no one place, perhaps, can all these layers be seen. In many places the lower have been covered by those of a later date, and in others the streams have cut through those already deposited, thus giving a greater variety to the soil and surface.

The metamorphic and igneous rocks contribute the potash and soda, the magnesia and iron; the silurian add the limestone; the devonian, the sandstone; the carboniferous, the fragile slates and clays which the river action and the elements pulverize and knead into a soil capable of sustaining all varieties of plants. The geologists tell us also of wonderful changes which have taken place in this same valley. They assure us that the general outlines of our continent have from the first been the same as at the present, only much smaller in extent; that, as

it increased in years, it gradually increased in size, till it assumed its present dimensions. The embryo of our continent is found in Canada, V-shaped, with its apex near the great lakes, and its sides nearly parallel with the present mountain ranges which bound our eastern and western coasts. At first a general enlargement took place by the addition of land to all its borders. During the silurian and devonian ages North America was, in the main, a continental sea. In place of the Rocky and Appalachian, there were only reefs and shallow waters to mark their future site, and the great Mediterranean Sea opened south into the Gulf of Mexico and reached north to the Arctic Ocean. This shallow sea was favorably situated for the growth of corals, and in it lived and moved an immense number of the strange forms of animal life which first peopled our planet. Millions of minute polyps were building the coral reefs as their remains so abundantly testify; thousands of crinoids waved backwards and forwards on their flexible stems, with their long tentaculæ extended in search of food; while in profounder depths, lay the leptæna, the terebratula and the nautilidæ, or, crawling along, was the slow-moving trilobite, with his thousand eyes upturned to the sun. So abundant were these animals in this early time, that their remains consolidated into rock, in many cases hundreds of feet thick, form the bottom of the larger part of this great valley.

During the carboniferous period there was a great increase of continental lands, which extend from the Arctic regions as far south as Tennessee, and as far west as Missouri. The Appalachians were not yet elevated, the great rivers were unknown, and the old interior sea continued to cover the present slope of the Rocky Mountains, and though much reduced in width, may still have been connected with the Arctic Ocean. The land of this region was then a vast marshy plain, with, at the most, gentle undulations in the surface breaking its continuity. "Over these marshes grew the clumsy sigillariæ and calamites, and the more graceful lepidodendra and conifers, with an undergrowth of ferns, while, upon the dry slopes near by, forests of lepidodendra and conifers reared their heads. This luxuriant growth was prolonged until the creeping centuries had piled up vegetable debris enough to form a coal bed. Trees and shrubs were expanding and shedding their leaves and fruit and dying, making the accumulation of vegetable remains. Stumps stood and decayed in the swamps, while the debris of the growing vegetation or detritus borne down by the waters accumulated around them; and their hollow interiors received sands, or leaves, or bones, or became the haunts of reptiles, as chance might direct." The coal period was a time of unceasing change. Eras of universal verdure alternated with others of wide-spread and destructive waters. According to the reading of the record, it was a time of great forests and jungles, and of magnificent foliage. The climate of the earth, during this period, even in the latitude of Baffin's Bay, was undoubtedly similar to that of the torrid zone, and it has also been thought probable that the atmosphere contained a much larger proportion of carbonic acid than it does at present.

Geologists are agreed that at least eight feet of vegetable matter were required to produce one foot of bituminous coal. To form our Pittsburgh seam, a layer of woody matter from sixty to one hundred feet in thickness would be required, and our Pittsburgh layer is only one of the many which formerly extended from one side to the other of our great valley.

During the cretaceous period, our central sea still existed in the Rocky Mountain region, but the dry land, more firm and compact, extended south to Southern Arkansas and Middle Alabama. The Appalachian Mountains had been elevated, and the Gulf of Mexico extended to the mouth of the Ohio This river and the Mississippi entered the Gulf by separate channels, and, as the former drained nearly the same region as at present, and the latter but a small part of its present area—the Missouri being but a puny stream—the Ohio was undoubtedly the larger of the two.

During the tertiary era important changes took place in our valley. The Rocky Mountains were partially raised, and the great internal sea disappeared. The Gulf of Mexico was still prolonged northward to the Ohio, and great fresh-water lakes lined the western slope.

In the Upper Missouri region, existed the cemetery of this epoch, which is remarkable for the great variety of bones which it contains of animals unlike any that now exist upon our continent. Not less than forty species of mammnals have been discovered, including three species of the camel, a rhinoceros as large as the Indian species, a mastodon, an elephant a third larger than the *Elephas Americanus*, a deer allied to the musk-deer of Europe, seventeen species of the horse—one lately discovered being only two or two and a half feet in length—a wolf larger than any living species, besides a great variety of more familiar animal forms, as well as some strangely compounded of many discordant characters. Hundreds of fossil turtles were observed by the early explorers, scattered over the surface, some of which were estimated to weigh a ton, whose remains it was found impossible to remove. The basin of the Mauvaise Terre is estimated by Hayden to cover a territory of at least 100,000 square miles, which would indicate a lake whose area was four times that of Lake Superior, the largest body of fresh water known. During the tertiary age the sun glowed with a more genial heat, and a semi-tropical vegetation such as that which flourished in the lower latitudes of the United States, prevailed as far north as Disco Island and the source of the Mackenzie river. But a change was at hand, a change for which science has thus far failed to find a satisfactory solution. "The sun was shorn of a portion of its vivifying rays; the seas became cold; shells of an Arctic type tenanted the waters, and an Alpine vegetation penetrated far into the temperate zone." During this epoch, the Rocky Mountains were raised six or seven hundred feet, to near their present level, and the Great Lakes which may have existed from remote geological time as longitudinal valleys, were greatly modified and enlarged. Gravel, sand, and huge boulders were scattered over the northern part of our valley, as far south as the Ohio river, and the surface of the rocks was exposed and grooved and striated in a remarkable manner.

From that time to the present the general size and direction of the Mississippi and its tributaries have not materially varied, except to contract its banks, as shown by the wide belt of alluvial deposit which borders it from the Gulf to the Ohio. Through this alluvium the river is now constantly changing its channel by wearing away the soft bank on one side or the other, producing huge windings or bends, which add materially to the length of the

stream. The actual meanderings of the river, or the difference between the direct distance from the headwaters of the Missouri to the Gulf and that by its channel, is estimated at 2,148 miles. The amount of detritus brought down this river and its branches is immense. For hundreds of miles above its mouth not a stone is to be seen. Every fragment of rock has, in its long journey, been ground to powder. A few years since a gentlemen from Louisiana met the speaker in Nashville, Tennessee. As he was about to depart for his southern home, he placed two or three stones in his trunk, with the remark, "These stones are for the children. They never saw any thing like them, and will be better pleased with these rough rocks than with anything else I can take them." The waters of the Upper Mississippi are clear and transparent, but the Missouri, or Mud River, pours into it an immense amount of whitish, turbid material; the Ohio adds a greenish color; the Red and Arkansas, an abundance of ocherous sediment, which, mingling with the decomposing vegetable matter from the crumbling banks of the Lower Mississippi, produces in the latter a peculiar compound attracting the attention of every one who sails over its sluggish surface. Many attempts have been made to estimate the amount of sediment brought down and deposited at the mouth of the Father of Waters, and though observers, as might be expected, have differed in their results, it is probable that the annual discharge is equal to a mass of earth not less than one square mile in area, and 241 feet in thickness.

The delta of this river is a peculiar feature in its topography. It covers an area of not less than 14,000 square miles, and is formed from sediment brought down by the river. Its surface is low and intersected by bayous, swamps, and lakes. These swamps generally consist of oozy masses of mud many feet in depth, with here and there hummocks or patches of uncertain earth, upon which a variety of semi-tropical vegetable forms have taken root. This is a region of cane-brakes and forests, the home of alligators, lizards and smaller reptiles, and abounds with mosquitoes and other venomous insects. To estimate the length of time required to form this delta has always been the favorite employment of geologists. This once known, several vexed questions regarding the antiquity of the earth could be approximately settled. But this problem, like many others, has baffled the skill of investigators. There is not, at present, sufficient exact data upon which to base conclusions. If examiners differ so widely as to the exact amount of material carried annually to the Gulf, is it to be wondered at that geologists should differ as to the length of time required for the formation of the delta, whose area and thickness are so uncertain, and which presents so many other difficulties to surmount.

We have thus imperfectly glanced at a few of the leading features of this great valley. A valley, which, in extent of surface, in diversity of soil, in variety and amount of mineral and agricultural resources, and in length of navigable waters, is unequaled by any other on the face of the earth, and is the only one worthy of holding in its embrace the great Father of Waters.

DISCUSSION.

Mr. H. B. Whittington thanked the gentleman for the excellent paper, and was especially pleased with its opening up a line of discussion that could not fail to be interesting and profitable. He hoped the day was not far distant when this class of studies would receive more attention in the schools.

Prof. A. A. Breneman, late of the State Agricultural College, said one mistake was, even where physics had been introduced into the schools, they had been put in haphazard, as it were, and experiments conducted for the mere purpose of amusement or entertainment. We have had too much text-book, and too little systematic practical teaching. Science should be introduced by contact with nature; get the facts first from the object itself, and verify them by reference to the book. With this kind of teaching, the study of physical science will not be found to be wearying or dull.

Prof. Geo. P. Beard, Shippensburg, said there was evidence that, ages ago, an inland sea had stretched down from the far North, over what is now Ohio and Indiana, and its lower bank or rim is well defined across the whole Mississippi valley, from the Rocky Mountains to the Blue Ridge; in Kansas it is a high table-land, in Southern Missouri it rises into mountains, but it is everywhere clearly defined. At some time the waters broke through, drained the prairies, and formed the river channels. Just so, in the distant future, the barrier at Niagara may break and drain the lakes above. If the study of geology and physical geography has done nothing else, at least they are revolutionizing our methods of teaching geography. Instead of the old labor of memorizing thousands of names, we are beginning to use fewer terms and grander generalizations.

Hon. H. C. Hickok said the problem raised by the gentleman from Shippensburg was a simple one. That a granite range or dike extended across and formed the southern rim of the great lake of the Mississippi Valley, is evident from a glance at the map, the Ohio river being thrown so far westward for an outlet, and the Tennessee and Cumberland deflected northward by some primeval barrier south of them. The outlet where the Mississippi now flows drained the great basin, and the subsiding waters, following the cracks in the surface, formed the channels of the rivers. The geology of the eastern rim of the valley beneath the surface was almost directly the opposite of its surface conformation. The strata along the Ohio and Mississippi are all horizontal, one layer on another, just as they were deposited, showing no upheaval, and broken only

by denudation as the waters subsided. Some time before we were born, an immense force, volcanic, as tidal wave from the southeast, moved these strata forward in Western Pennsylvania, and threw them into waves like the sea. From the Alleghenies to Eastern Ohio, there are six of these waves. The motion was westward—the latitudinal direction northeast and southwest. Here at Pittsburgh, we are in the fifth basin. Of all this there is no indication upon the surface; you must go beneath for the evidence. The sixth basin, which is fifty to sixty miles wide, is the great oil region. There is a little oil found on this side of the sixth dividing ridge, but not enough to pay for boring.

Now, shall we teach the physical sciences in school? He thought his own experience demonstrated ironically that it did not pay to be a geologist. When he left the School Department he went into the oil region to recuperate his health and fortunes. He proceeded to examine what connection there was between the oil and the geological formation; beginning with the proposition that oil, like water, would obey the law of gravity, and naturally run to the bottom of the basin, except when the dynamic force of the gas would force it up the slope. Practical men went to boring for oil where they saw it upon the surface; he had sunk his first well partly upon scientific principles, and struck the first flowing well on Oil Creek; it flowed regularly every six hours for six days in the week, and rested on Sundays, until that fact was commented upon in the *Venango Spectator*, when it began and flowed on every day in the week until it ceased entirely! He had studied the formation, on foot, from Red Bank to Brady's Bend, Parker's Landing, and up to Clarion; and his colleague, Prof. A. J. Warner, down through Butler county. They took ten miles of oil leases on the basis of the connection between oil and geology. Meanwhile others had struck flowing wells, and the price of oil ran down; he could not command capital, and therefore could not hold his leases, and so all his labor and his science were lost. To-day other men who have no science are reaping the profits off that same territory—they get all the money and the luckless geologist gets none. Therefore, it is not wise to have our pupils understand science, if success is all luck. [Laughter] As it is, he had a bundle of oil leases that he would sell at something less than half-price.

The scientific labor was of some use, however, for there were parties in Pittsburgh preparing to embark largely in sinking oil wells on the lower Allegheny river, when an article of the speaker's in the *Clarion Banner*, copied into the Pittsburgh *Gazette*, in March, 1861, demonstrated the fact that it could not be done profitably, and the project was abandoned.

The vast progress in the application of science to mechanic arts and industrial pursuits has demonstrated that the day of groping for results has gone by; we want educated mind applied to all these questions, and they only are wise who use all the opportunities of informing their minds and understanding God's laws in nature. Thus only can we successfully avoid continued failure and wasted effort. Men are beginning to find out that there are some things that cannot be done; yet there are those even now, who spend years of labor and thought upon the problem of perpetual motion, when even a smattering of science would teach them that it is simply an impossibility. The schools must save all this waste of blind, mis-directed effort, by teaching the principles of science to their pupils.

Prof. Jillson referred to the geological survey of the Lake Superior region in 1848, and its discoveries concerning the first dawn of the North American continent. When the Appalachian chain was not yet elevated, but simply a line of sand-bars, as was also the Rocky Mountain chain, the space between them was an immense sea, containing animals belonging to the silurian period. He had seen strata of shells fifty feet in thickness, where the rivers had cut through. In Middle Tennessee are coral reefs half a mile wide, once full of the life of that period. Upon the Ohio and Mississippi, the rocks through which they pass, if united, would often form a dome-like mass. Cincinnati is situated upon one of these domes of the silurian formation. It was supposed that at one time the Gulf of Mexico extended up to the mouths of the Ohio and Missouri, and they emptied directly into it, as the devonian runs up to the mouth of these rivers. When the tertiary was formed, the two rivers united and flowed on in the Mississippi. The Mississippi Valley may once have been a lake, whose waters were drained by a break in the barriers, leaving the prairies as we find them now.

Duet by Prof. Cargo and his daughter.

Mrs. Anna Randall Diehl read "The Young Soldier," a poem by Alice Cary.

After announcements from the local committee, relative to the excursion on the Ohio river, and from the enrolling committee, adjourned to 9 o'clock to-morrow morning.

WEDNESDAY MORNING.

SESSION opened at 9. A M. o'clock, with prayer by Rev. A. B. Miller, D. D., of Waynesburg College.

The following committees were appointed:

Auditing committee—Messrs. George L. Maris, C. H. Brelsford, and J. H Young.

On selecting a place for next meeting—Messrs. W. W. Woodruff, J. J. Kincaide, and Geo. P. Beard.

Mr. Edward Shippen, of Philadelphia, was announced on the programme for a report from special committee. This report was presented, and in the absence of Mr. S., was now read by Prof. E. M. Still, of Pittsburgh.

REPORT ON THE SUPERINTENDENCY.

BY EDWARD SHIPPEN.

TO THE STATE TEACHERS' ASSOCIATION:

The committee to whom was referred the following resolution, viz:

Resolved, That a committee of five be appointed to report at the meeting of 1873 upon the necessity of a law, making superintendency and concerted action in teaching and school government obligatory on cities as well as counties.

Respectfully report:

That there are two or three localities in the State of Pennsylvania without the services of a superintendent in their public educational structure, and which have never yet been favored with such an auxiliary. The utility of a superintendent is no longer problematical, as the entire country has given its voice in its favor, and it is the exception now rather than the rule to find any city, village or town without such officer. In Philadelphia, Allegheny City and Lancaster, however we do not find a superintendent. The omission has given rise to very serious comments at the hands of foreign visitors, and of those from our adjoining and neighboring states In the judgment of this committee a superintendent of public schools has became an essential part of every well-organized system of public instruction, and without it perfection cannot be obtained.

We find superintendency in all relations of life, commencing with the infant in the cradle. We find it in the workshop. Every well-arranged manufactory must have this element of success, call it by what name we may. The superintendent is found in all industrial combinations, in banks, in railroad operations, in the army and navy, in the coast service, in every department of Government, in every religsous body, and in every state, city and county, almost in the land, save and except, perhaps, the great city of Philadelphia, Allegheny, Lancaster, and a few other educational communities out of the state. It would hence appear that the feature has been established as if by one voice and by one common consent, and has proved itself of such service that its universality should, of itself, be sufficient testimony of its absolute necessity.

The superintendent is not to be the law-making power, if as some opponents fear, but the one to see that the school-law rules and regulations are carried out. His duties are to harmonize, to encourage, cheer, enliven, and to stimulate all in the performance of reciprocal duties; to be the friend of the teacher, pupil and parent; to inquire and report upon all such matters as pertain to the well-being of the system; and to awaken and keep alive and fresh in the public mind and heart, a deep continuing interest in the policy of public instruction. It becomes his duty to settle all minor controversies between teachers, such as should never be brought before the public or directors; to see that the prescribed course of study is adhered to; that no books be used as text-books, save those authorized by law, as well as to guard against the undue introduction of new books, or new editions of those in use; in fact, the superintendent's duty covers a vast field which seems to this committee as important, and even more so than that of any other educational officer—that a perfect system of public education cannot be established without his services in keeping the same in due order and harmony. And your committee is therefore constrained to report that they can conceive of no reason why any city, large or small, within the borders of our state, should be without a superintendent of public education. The magnitude of Philadelphia would, of itself, seem an argument in favor of superintendency. It contains 800,000 inhabitants. There are 85,000 pupils in attendance upon its public schools, it contains over 1,600 teachers, 400 schools, 29 separate and distinct boards of school directors, about 400 school directors, and a Board of Education of 29 members. The school directors are elected at the nomination of party rings and cliques. The Board of Education is appointed by the judges of the local Courts. Philadelphia expends annually over $1,200,000 for current school expenses, and within a few years has expended three or four millions of dollars in school lots and edifices, and Philadelphia has never had a superintendent of schools. We must be just to Philadelphia in saying that many of her schools have attained a high character and are justly entitled to be placed among the first in the land. This, however, has been wrought by the almost superhuman exertions of teachers and of the valuable men who have been in service as committee-men. Yet we are well advised that there does not exist, and never has existed, that harmony and accord which are essential to every system to make it a complete success.

Public election of school directors is not calculated to serve the true interests of education. We know well that, all through the Commonwealth, men are elected to fill that position who are morally and intellectually unfit to have the care of children and teachers; and we feel assured that Philadelphia forms no exception to this rule. We are well aware that at all times there have been noble men in that city who have worked well in the interest of education, and we know also that they have at times contended with the illiteracy, partizanship and ignorance of elected public servants—and that their efforts have always been retarded by reason of the want of proper superintendency. School Boards are the only superintendants. This gives Philadelphia 400 *quasi* superin-

tendants, fit and unfit, certain and uncertain, dead and alive. The Board of Education has forced upon the school directors, under law, a system by which incompetent teachers cannot well be selected—and thus it is that the schools of Philadelphia have attained their present standard. Whatever of excellence there is in them, we must place it where it belongs, viz: to the indomitable energy and intelligence of the teachers and those directors who have devoted their time, energy and activity to the work; in other words, to those who have done as far as was in their power the superintendent's work, or a portion of it. Many educational men of Philadelphia have urged and urged its Councils for an appropriation to meet the expenses of superintendency, time and again—never with success. The remedy is with the Legislature. It may accord to the Board of Education such portion of Philadelphia's appropriation as shall be necessary for proper salary, and this committee recommends this course; also, the enactment of a law which shall require superintendency in Pennsylvania wherever the same does not now exist.

To some extent the objection to the feature of superintendency in Philadelphia has arisen from the fear of teachers, who, accustomed to work on a given line for a long period, imagine that the superintendent must necessarily be a bear or some other ferocious and wild animal. That he will be a severe man, and harsh, and that he cannot sympathize with the teacher. They are apt to indulge in the fancy that he must necessarily be an intensely disagreeable, ill-natured biped, instead of a pleasing, humane, and sympathizing friend. The board of school directors are apt to fear that the superintendent will interfere with their duties, powers, privileges and prerogatives—and thus it is that Philadelphia, the second city of the United States, has to-day no one who supervises the school system as a whole, and no one who can effectually give force to the laws, rules, and regulations affecting it as a whole.

Besides all this, Philadelphia has been excluded from the jurisdiction of the State Superinlendent, and is not within the care of the state department. Thus the system of the entire state is incomplete by the separation of a large part from the whole. This evil has also another mischief to Philadelphia. The school department of the state is always represented indirectly in all its interests by the State Superintendent, before the Legislature, through the report which he annually makes. By courtesy, he makes mention of Philadelphia's schools, but he has no official information of them and cannot be expected to interfere with the jurisdiction of the Philadelphia Board of Education. Thus the educational interests of Philadelphia suffer from the want of proper legislative measures.

President Hays said it was generally the fact that one mind controlled the whole enterprise; a railway has many directors, but one brain manages and controls its affairs—it is Garrett, or Vanderbilt, or Tom Scott. Every institution finds its effectiveness increased as it finds a competent man for its head. Five or six men will not "run the machine" as well as one. There may be many good men in the schools in Philadelphia; there *are* in Allegheny; but it would be for the better if the latter were consolidated with Pittsburgh and the former with Pennsylvania. The teachers may be faithful; but every one for himself makes only guerrilla warfare.

Mr. H. B. Whittington thought that the paper should have given the Philadelphia teachers more credit for the progressive movement inaugurated by and among themselves. It has not yet reached the desired result, but is seed sown in good ground and will produce abundant fruit. It is a mistake to suppose that Philadelphia teachers are opposed to the superintendency; such is not the case. They have started a sectional superintendency, exercised by the principals; but one who has a division to teach cannot find time to give thorough supervision elsewhere. The trouble in Philadelphia is that the school department is subordinate, not co-ordinate; and money cannot be appropriated without going through Councils. The mass of the teachers are a unit in favor of the superintendency; it is the great desideratum, which would make Philadelphia schools the best in the world.

Supt. Douthett, of Allegheny, considered the superintendency a most essential element of the system, but did not think it was good policy to separate cities and boroughs from their proper counties. He thought there should be one superintendent of the whole, with a sufficient number of competent deputies. This would give a more compact organization; besides, it would enable the chief officer to use his help where it is most needed. In the cities, as Allegheny, for example, the ward principals are generally competent to superintend the city. Do *their* schools need supervision as the rural districts do, where young and inexperienced teachers are employed? He believed in a board of supervision, whose members could divide their time and labor among those who needed it.

President Hays said the last speaker believed in the Irish system. In that country, there is a general superintendent, district superintendents, and sub-districts with a deputy for each; and so thorough is their work that Dr. McCosh says the general superintendent can immediaiely ascertain the progress of any pupil, or the wants of any individual teacher or school.

Mr. E. M. Still said it would be unjust to leave the impression that the Allegheny City principals knew all and the country teachers nothing. The fact was that three-fourths of those principals came from the country.

Supt. Douthett said that was one of the things he complained of: As soon as the country had its teachers well-trained, the city called them loudly and they responded, of course. We need not go to Ireland for the organized system of supervision; it is working successfully in Canada. A board of supervision such as he had indicated, could work up the country during their school term, and concentrate upon the city the remaining part of the year. The county superintendent in a large district cannot, under present circumstances, visit nearly all the schools in a year; and he has so little time even in those he does reach, that the visits are unsatisfactory to all parties. It is all well enough to have superintendents for cities; but he would like the rural districts to have some help also.

Prof. Burtt said he did not see the wisdom of having one superintendent over both city and county. If the compact organization indicated be good, why not apply it to states instead of counties, and let the central department apportion the districts. We have this plan in some measure now in the state and county superintendents. But it was his opinion that when a city was large enough to keep one man employed in supervision, and the county outside large enough for another, it was wisdom to separate them. Let us learn wisdom from our manufacturers. Their great principle is division of labor; one man does but one thing, and he does that one well. By confining his attention to a single point, he does better work. Now, the duty of a county superintendent differs from that of the city officer; in the country, the work is done chiefly in ungraded schools, and the knowledge required to manage these will not answer for the graded schools of the cities. The man who studies the best way of operating the ungraded country schools will have enough to do, and may well leave the city to another. The theory of the age is division of labor; he who tries to do everything does nothing well.

Mr. Whittington was surprised that Allegheny, which was just ready for the superintendency, had not yet adopted it; and wished he could say Philadelphia was in the same position.

The discussion closed here, and the President introduced Prof. Richard S. True, of New York, who said that he was a teacher of elocution and music, and was crazy upon the latter subject, by which he lived in this world and which would introduce him into the other; for so far as we know, music is the only exercise begun here and continued there. He then sang a solo—"The Little Fat Gray Man."

Profs. Brooks and Shœdler having been detained by a land-slide, the paper of Supt. H. S. Jones, of Erie, upon the Best Plan for the Organization of the Schools of a Township, was read as follows:

This subject might better have been treated by some person more familiar with its practical details, but I have endeavored to make use of the experience of others, applying recognized principles thereto, and present the following plan:

1. Each township should have a board of directors consisting of three members, so elected that each year one would pass out of office. The principal duties of the board should be paying taxes for school and building purposes, purchasing sites and erecting buildings, electing teachers and giving general directions for the management of the schools. The directors should receive a fair compensation *per diem* for time actually spent in school work; the compensation received, should at least be sufficient to cover traveling expenses.

2. When a township has ten or more schools, it should be the legal duty of the board of directors to elect a district superintendent, whose whole time should be spent in visiting schools, in looking after their welfare and in conducting the district institute.

3. The directors of two or more townships having less than ten schools each, should be empowered under the direction of the county superintendent to join in the election of a district superintendent, whose duties should be the same as those of a superintendent elected by the directors of a single township.

4. Townships supporting ten schools, with an average attendance of thirty pupils each, should have, centrally located, a school of higher grade for the older and more advanced pupuls.

5. Townships that have joined in the election of a district superintendent should have, in common, a school of higher grade; the expenses of said school to be borne by each township in proportion to the number of pupils sent by each.

6. The district superintendent should be required to report monthly to the board of directors and the county superintendent, giving such facts and statistics as shall show the general condition of the schools as to attendance, studies, discipline, progress, buildings and grounds.

7. The State by proper enactment should not only *direct*, but encourage by increased appropriations, the work of closer supervision and higher education in townships.

Mr. W. W. Woodruff, of Bucks, was strongly in favor of close supervision. He believed six directors in a district were better than three, and was opposed to paying them for their services; the highest duties we perform are never paid for. Only those directors who are willing to attend to their work and endure the obloquy that sometimes attaches to them, are fit to hold the position. Directors who act the part of "dogs in the manger," who have poor relations to provide for as teachers, or who are fond of office

for its own sake, are not the class of men that are needed. While he was in favor of close local supervision, he thought the county superintendent should retain the sole power to examine teachers and issue certificates. Both directors and superintendents should remember that behind every teacher stand fifty pupils, of whom they are the guardians. Especially on examination day should the vision of those pupils exclude all other interests.

Prof. Beard hoped the time would soon come when all our country schools would be graded; the great leakage is in lack of economy of the teacher's time and work. We should lessen the number of classes and increase the time given to each. Where population and wealth make it possible, one or two townships should have a high school. The grade should be uniform in primary, intermediate and high schools, and the course in each the same everywhere. This systematic gradation requires close supervision, and the best teacher should be superintendent. He thought it would be humane to annex Philadelphia to the state system.

A gentleman on the floor, whose name could not be ascertained, inquired how these advantages are to be secured, when directors have in view not a high standard of education, but the "almighty dollar?" How shall we reach these directors?

Mr. H. B. Whittington said the answer to that question could be given in a word—*Agitate!*

President Hays said it was desirable to impress these important points upon the minds of the older and more advanced pupils. This does not directly reach the directors, but it helps to manufacture public sentiment; get the youth of a district "dead set" on a higher standard, and the old folks will have to come. It is true that here and in county institutes, we reach only those who are nearest right, and not those who are furthest wrong; but the utterances go out to the people through the press, and have their influence.

Mr. S. D. Ingram would say for our encouragement that when this Association organized, in 1852, there was no State superintendent and no normal school; we got these by agitation, and are pressing forward to secure other measures of vital importance. The superintendency would be of great advantage to Philadelphia; the Board of Control (efficient though they be) are not selected to enter the schools and examine teachers and classes. They should have one person of high qualifications as superintendent of the whole city assisted by district superintendents for subdivisions of convenient size. Opinions differ on the question of township organization. He endorsed the recommendation of three directors to every district. The objection is made, If six directors will not do the work, how will you get it out of three? He replied, By paying them for their services. Men say they cannot afford to lose the time; give them a fair day's compensation—not a salary that would make it a political object. Somebody will tell you, "Get large-hearted men who don't want pay." There is as much buncombe in that as in a superintendent's recommending pay to directors. He believed in separate superintendency for cities and boroughs. Harrisburg has a city officer, and Middletown pays its high-school principal $125 per month to superintend her schools. Local superintendence improves the schools, and brings up the salaries of competent teachers. The officers soon find it their duty to tell the directors that the best teachers should be in the primary schools, and then receive the highest pay.

Music followed—a duet by Prof. Cargo and his daughter.

Prof. Lemuel Amerman of Mansfield, read a paper on Natural Science in Our Common Schools.

NATURAL SCIENCE IN OUR SCHOOLS.

BY L. AMERMAN.

THE public school has been well called the people's college, for here alone the masses receive their only educational advantages, it being reserved for the privileged few to enter our colleges and universities. So patent to all is this truth that we need not delay in its demonstration. The importance, then, of securing in these schools such development and discipline of mind as will enable the masses to grapple successfully with the great questions of the day; such a knowledge of things as will best fit them for the active duties of life; such stimulus to self-culture as will aid in ameliorating the condition of the race, thus securing a higher civilization; in short, I say the importance of such an education as will insure successful men and good citizens, can scarcely be over-estimated. For, if we fail here, we fail entirely and beyond remedy, and instead of decreasing the great army of ignorance and inefficiency, the mortal enemy of civilization and good government, it is recruited by those whom we should have as allies.

That our schools, though excellent, when compared with the past, fail, in a great degree, in securing the ends just mentioned, the observations of each will attest. The causes of this may be and are many. But first among them, I apprehend, is a defect in the curriculum of primary and district

schools. That truant officers should be a part of the system and compulsory education gravely talked of, reveals an opposition on the part of pupils, which is certainly very detrimental to the success of the schools. Why children, naturally inquisitive, ever anxious to hear and see, annoying their parents with puzzling questions, and constantly led by their curiosity into dangerous places, should be unwilling to be taught is certainly strange. I remember once, when a child, going with a workman to clean out a spring upon my father's farm. He threw out with the mud and slime a curious creature which he called a crab. While I was looking at it with wonder, it started for the water, but I thought it moved backward, and, anxious that it should go forward, as nature intended it, I picked it up and turned it about, receiving for my pains a severe pinching which taught me that, in the theory of crabs, at least, nature was right and I was wrong. And now when I see the child-mind refusing to go, as I think, forward, I remember nature's wisdom in forming crabs to go seemingly backward, and wonder whether she does not also know more about the child-mind than I do. Why should the child refuse to reason abstractly and groan with mental pain under his tasks of arithmetic? Why should he care more for the fields and woods, with their birds and flowers, animals and trees, stones and brooks, than he does for the niceties of his logical grammar, in which his teacher delights.

Nature says, "Train the perceptive faculties first; and man says, Not so, but reason. Here, then, is one great obstacle to success in developing the mind. Much of the present curriculum of the primary school is naturally distasteful to the child, and when he is compelled to go through with the course it affords him but little development for his mental faculties. Natural science, Nature's book, is what his mind instinctively craves, and what wisdom demands should form a great part of his study. Animals, plants, rocks, his own body, the changes which are ever taking place above him, beneath him, within him—these are the studies best adapted to develop his powers of mind, to stimulate and feed his curiosity, and to make school a happy, joyous place, a place of entertainment instead of a gloomy prison.

But, as mind grows, we demand of our curriculum subjects for discipline as well as development; subjects which will demand of the wandering mind closest application; which will call into requisition all its powers, and require the strongest exercise of the will to persevere to the end. Natural science is such a subject. Training most perfectly the perceptive faculties, it affords memory, imagination and reason a most fertile field for culture, demanding at the same time the severest exercise of each in order to secure success. If this, then, were all that could be advanced in favor of introducing this study in our schools: that it is best adapted to the capabilities of the child's mind; that it secures the perfect development of faculties which otherwise, to a great extent, would remain dormant; and that it affords excellent discipline,—these would be reasons enough to warrant its introduction into our schools. But these must be supplemented by the strongest argument known in this utilitarian age; it will pay in dollars and cents. This study is of direct and paramount importance to the industrial classes, farmers, mechanics, merchants and manufacturers as well as professional men. The spirit that has made a hobby of arithmetic and given it a prominent place in all of our schools, from the most primary up, thinking doubtless that as its problems deal with dollars, it somehow mysteriously has to do with producing them—this spirit, I say, would immediately adopt the study of natural science if it but knew how, in every avocation of life, it would teach him to utilize the forces of nature and thus make his hand more cunning and powerful; how for the merchant it would serve to increase productiveness. How for the farmer it would increase the fertility of his soil, improve his stock and cure their diseases, destroy pestiferouy insects, make him master of storms, and in every was lighten his labor; how for the mechanic, it would aid him in transporting and preserving his wares; how it would show the manufacturer more and better modes in which to manipulate his materials; how for the housewife it would warm and ventilate her apartments properly without waste of fuel, serve cheap and wholesome food, preserve the health of the family, cleanse and clothe, without making her a slave; how by the masses having a knowledge of this subject, we should have less sickness, less poverty, less misery; for our buildings fall and crush us, our bridges break and drown us, flues are defective and burn us, boilers burst and scald us, bad food and poor ventilation sicken us, weak hands and much work kill us, and we are very slaves where we might be lords.

But not only is this study of such practical importance as is no other; it at the same time serves to give that higher moral culture without which no system of education is complete. It is a "looking through nature up to nature's God," "learning from his works, his attributes: omniscience, omnipotence, omnipresence; winning for him from mankind adoration and love.

Again, our civilization differs from that of the ancients, the influence of Christianity aside, only in our compelling the elements to perform our labor instead of depending upon the muscles of slaves. It is said that a hundred thousand slaves were engaged at one time upon the pyramids of Egypt, while we to-day, acquainted with some of the laws of nature, know that about fifteen tons of coal under the boiler of an engine is equal to the work of a slave for a life time. Athens in her days of glory had four hundred thousand slaves, with but twenty thousand freemen; while we are freemen every one with fire, earth, air, and water as our slaves. Have we reached the end of scientific investigation? Have we robbed nature of all her secrets? Must our civilization, as it depends upon the increased productiveness of labor, here stop? The grandeur of past achievements in the scientific world leads us sometimes to believe that we have entirely explored the recesses of the unknown. But then a few years ago men had the same belief, before Morse had attached his messages to the winged lightning, before Stevenson and his helpers had rightly harnessed steam, before Howe's sewing machine had liberated a million of enslaved girls and women, before Daguerre had dipped his brush into the sun-beam, before Fulton's wheels splashed, or Fields had bound the continents with magnetic cords, before the threshing machine and reaper had made the farmer a king, before Pennsylvania's coal warmed our busy millions, and before her oil had lighted the world. In view of such facts, who dares say this is the end?

The times demand good observers, careful thinkers, enthusiastic students of nature, that there may

be no chance but insured progress in this direction. Nature yet has secrets with which to bless us, that she will reveal only to the wise and industrious observer. To our schools, the schools of the masses, we must look for these students of nature.

If, then, development and discipline of mind, utility in all the affairs of life, culture of the moral faculties, and advancement in civilization, can best be secured by the study of the natural sciences, why not introduce this study into our schools?

We have no time. The present course demands all of our attention, and even then we are unable to master it. Then take from the course such studies, no matter what they be or how venerable, as are wanting in these essential qualities just mentioned. Drop some of your logical grammar, abridge your your geographies; the smaller rivers, lakes, mountains and towns will take care of themselves. Modernize your arithmetic and use only the practical part of it. Beware of long logical formulas in mental arithmetic. Prune the present course judiciously, and time will not be lacking to devote to the study of this most important branch.

Our teachers are not qualified to teach this. This is truth, and a more serious objection. But if the foregoing be true, this difficulty can and must be surmounted. Our normal schools must meet the demands of the times, and teach, for the present at least, the elements of these sciences. When Guizot said: "A bad schoolmaster, like a bad priest, is a scourge to the commune," he meant that schoolmasters teach what they know. "What you would have appear in the life of a nation, put into your schools," say the Prussians; and adds one of our own countrymen, Prof. Phelps: "What you would have in the school put in the teacher." Yes, the times demand that our normal schools introduce into their curriculum the natural sciences. They are training teachers for the nineteenth century, teachers for a generation, of which God and the times demand greater progress in civilization than from any previous. "The powers that be" must require, before granting license to teach, a knowledge of one or all of these sciences, and little by little teachers will become competent and impart instruction in them. But a few years ago the history of the United States was not required by law, and our teachers knew nothing of it. But when it was required teachers set themselves about it, and now they are prepared to teach it. So it will be with the natural sciences.

It is encouraging to those who have any sympathy with thoughts like these, to notice that our State Superintendent recommends that the study of physiology be introduced into our schools which I take to be but an intimation that it soon will be by law. Fellow teachers, the educational progress of this Commonwealth is in our hands. Upon us rests the responsibility to find out the best ways and means to secure success, and, having found these, God requires us to be honest in using our every energy to secure their adoption.

DISCUSSION.

Mr. S. D. Ingram was called on to open the discussion, but excused himself.

Mr. H. B. Whittington said this is a practical question, and elementary science could and must be introduced into our schools. He referred to what had been done in his own school, and said that in Philadelphia it was done in such a manner as to make the facts of the text-book living realities, and induce the pupils to read in the great book of nature. He believed the schools of that city were ahead of any in the country, if not in the world.

Prof. Verrill inquired if their schools are already superior to all the world, why do they want the superintendency?

Mr. Whittington explained that he referred only to this one point. The schools are superior in other respects; but there are deficiencies also, and these would be corrected, and completeness secured by thorough organization.

Mr. W. W. Woodruff said that perhaps we are getting a little crazy on this science question; at least we are carrying the thing to extremes when we talk about making science a means of moral culture. There is no moral culture in dead scientific facts; that must come from the personal influence of a living moral instructor. These extravagant ideas of science too often precede a skepticism that draws the mind away from the great fountain of knowledge, the Father of all. He believed science should be taught in school, but doubted the wisdom of buying expensive apparatus for elementary teaching. The teacher who cannot provide his own apparatus for simple experiments had better let the subject alone. Your complicated experiments may amuse children; but they gaze at them with an animal stare, and learn nothing.

Prof. James G. Clark, of Syracuse, N. Y., sang a solo.

Nominations were made for officers to serve for the ensuing year, as follows:

For President.—George J. Luckey, Pittsburgh, Dr. Geo. P. Hays, Washington.

For Vice-Presidents.—W. N. Aiken, Lawrence; T. J. Chapman, Cambria; Miss Martha Neville, Blair.

For Secretary.—J. P. McCaskey, Lancaster; J. E. Woods, Clarion; T. H. Douglass, Pittsburgh.

For Treasurer.—John Morrow, Pittsburgh; J. F. Sickel, Philadelphia (declined).

For Ticket Agent.—J. Fletcher Sickel, Philadelphia.

For Executive Committee.—James L. Harrison, Pittsburgh; L. H. Eaton, Pittsburgh; S. A. Will, Pittsburgh; Geo. P. Beard, Shippensburg, B. S. Keith, Blair; H. S. Jones, Erie (declined); W. W. Woodruff, Bucks (declined).

For Enrolling Committee.—Charles H. Brelsford, Philadelphia; J. Q. Stewart, Lawrence; M L. Knight, Beaver; Dr. A. B. Miller, Waynesburg; H. B. Whittington, Philadelphia (declined); J. B. Holland, Blair.

Mr. H. B. Whittington called up his resolution relative to the manner of holding

elections, which was postponed yesterday morning.

Mr. Ingram said he had no objection to the resolution; but with reference to last year's election he would say that he had been one of the election officers at Philadelphia, and knew of nothing improper in connection with the voting.

Mr. Whittington explained his remarks of yesterday, but insisted that the electioneering for some years past had been disgraceful.

The resolution was amended, on motion of Prof. Burtt, so as to provide for a committee of five, and adopted.

The Chair appointed Miss Jennie Ralston, Messrs. G. M. Phillips, J. J. Kincaide, J. C. Dolan, and C. H. Brelsford.

Adjourned to 7½ p. m.

WEDNESDAY EVENING.

MUSIC by Prof. Cargo opened the evening session.

The President appointed the following Committee on Resolutions: Messrs. George P. Fulton, S. D. Ingram, Dexter Stoops, Misses Mary Stewart and Mary McCord.

Dr. A. E. Wood, of Pittsburgh, then read a paper on The Conflict between Science and Theology, of which the following is a full abstract.

CONFLICT BETWEEN SCIENCE AND THEOLOGY.

DR. E. A. WOOD.

LADIES AND GENTLEMEN:

My discourse is on the conflict between science and theology. I acknowledge the vastness of the subject; I confess that it is a dangerous theme. It is vast, in that science or religion continuously and intimately permeate every department and condition of life; and it is dangerous, in that custom and education have so completely occupied our minds with the belief that everything under the name of theology must be right, that an ordinary audience is apt to misunderstand and condemn all honest inquiry in this direction. I feel even at this late hour like shrinking from braving what is probably the long-cherished opinion of the majority of my audience, and were it not that this was chosen by request, I would occupy your time with a more congenial subject.

To prevent all misunderstanding let me announce that theology is not the Christian religion; theology is man's work, Christianity, God's work. Theology may be false, Christianity cannot be false. We have a religion and religions; one religion which is of divine origin and therefore true, and religions which are a of human origin and possibly false. If I consider what I suppose to be false doctrines in theology, I hope I shall not be misunderstood as condemning any part of true Christianity.

Every one who is disposed to reason will agree to the correctness of the following propositions:

First—Scientific research should be conducted with the determination to arrive at the truth, the whole truth, and nothing but the truth.

Second—One truth must agree with another truth, and all truths must harmonize one with another.

Among the many obstacles that have retarded scientific progress, I shall make special notice of two most important ones. The first is the tendency of some scientists to meddle with theology; and the second is the tendency of many theologians to meddle with science.

In a physical sense, science and revelation have nothing to do one with the other. When a chemist sits down to analyze a potato, it is not his duty to pray to God or to examine revelation first, from the holy fear that he might discover something in the potato that would contradict Bible story. His duty is clearly to attend to his own business, the analysis of the potato, find out the truth and let God take care of revelation. God made them both, or he did not. The scientist feels sure that God made the potato, and if it contains secrets within its starchy cells that may or may not conflict with revelation, in the sacred name of truth let them be told.

We have said that the scientist believes that God created the potato, and he is so secure in his belief that he is not jealous lest the theologian might destroy that belief. Is it possible that the theologian has not the same amount of credence in revelation as the scientist has in science. Is his lack of faith the reason why he is so jealous and fearful lest the scientist may destroy revelation? Under a somewhat similar ordeal Christ once rebuked his followers by saying "O ye of little faith!" What would be his condemnation to-day? If the theologian had the minimum of faith, which is as big as a grain of mustard seed, he would feel more secure of the divinity of revelation. He does not feel secure or he would not be so jealous and intolerant toward science.

The domain of science is different from that of revelation, and their methods and kind of teaching were intended to be and are separate and independent. The mode of their origin their attributes, their design and their destiny are dissimilar. The one is cosmical; it begins, deals and ends with time, and its relation is with the material world. The other is a supernatural and extra-cosmical, having faith for the key which opens the door of Hope to a spirit-land where man is immortal and which dominion is called eternity. Science belongs to the world of matter, and it is received through the medium of reason. Revelation belongs to the world of spirit, and it is received through the medium of faith Two worlds, and two faculties whose orbits inscribe distinct and widely-separated cycles in the economy of the universe.

They have this additional and important difference:—Science is a problem unsolved, with Nature as the teacher; revelation is a problem, solved with God as the teacher. The scientist is constantly plying questions to nature, and how all-important that he should ask his questions without bias, that he should search without prejudice, and that he should reach his conclusions without the hindrances of fear, or the persecutions of the theologian. Revelation on the other hand is complete, it is not given for our inspection, but for our adoption; no reasoning or argument can add to it, and until science is perfect, and in its perfection becomes an infallible indicator that revelation is false, no scientist has a right to attack its tenets, or seek to demolish its principles.

Enough is said, it is hoped, to show the wide difference and distinction between the two. In drawing this dividing line between them, let me not be misunderstood; although I hope that I shall serve the interests of both, yet I am not here to-day to attack or applaud either science or revelation. My sole aim in this direction is to point out the ruinous folly from the misdirected efforts of one department to meddle with the other, by bringing the two into antagonism.

Prof. Henry, director of the Smithsonian Institute, uses the following language: "Much harm has been done by the antagonism which has sometimes arisen between the expounders of science on the one hand and those of theology on the other, and we would deprecate the tendency which exhibits itself in certain minds to foster feelings antagonistic to the researches into the phenomena of nature for fear they should disprove the interpretations of Holy Writ made long before the revelations of physical science, which might serve as a better exegesis of what has been revealed; and also the tendency to transcend the known and to pronounce dogmatically as to the possibility of modes of existence on which physical research has not, and, we think, never can throw light."

Let men say what they may, there is an ingrained tendency in every human being that is endowed with reasoning faculties, to believe in immortality. When a man says he does not hope to live again, he is guilty of the greatest falsehood that ever stained the lips. It is a falsehood because it is unnatural that a sane mind should not desire to exist forever. True, the belief in the immortality of the soul is a selfish one, but selfishness is a powerful incentive in other beliefs besides that of the religions. All believe in the hereafter, because we want to live forever; we even cling with tenacity to animal life, but as physical death is inevitable, we extend our aspirations beyond the grave and fondly hope that this life is not our goal. I admit that this belief in immortality is like all other religious beliefs—indemonstrable. I am not here to account for the cause of the fact, or to present the arguments to substantiate the fact, I only claim that the fact exists.

This digression from the main body of our subject is not so much to advocate the claims of a religious belief, as to impress upon you that whether religion be true or false, the fact remains that the universal desire for and belief in some religion does exist and makes it utterly impossible for any attack by scientists to harm much less demolish popular religion. And it is just this

very attempt to do so that has aided to retard scientific progress and tainted it with the odor of skepticism and infidelity. Do I not state a well-known fact when I say that philosophy and infidelity are almost synonomous in the estimation of the world? Why is it that so many scholars have been and are to-day looked on as skeptics? The principal cause is that they have sometimes attempted to measure the infinite with the finite.

Let the people once suspect that science is promulgated for the purpose of overthrowing their faith, and at once science is clogged with so much dead weight—the dead weight of suspicion and jealousy. This is precisely the attitude in which science would stand if some over-zealous philosophers had their way. It seems a matter of small moment that Hume, or Paine, or Rousseau, or Strauss should argue against popular religion; but it is no longer a matter of small moment when the devotees of that religion take up the taunt and say, "If your philosophy has taught you nothing better than to doubt and scoff at revelation, then is your philosophy wicked and we will have none of it."

This feeling is not limited to a past characterized by religious intolerance and persecution, but it poisons the mind of the populace to-day. Within a few months, a scholar of New England wrote to the meeting of scientists who honored Tyndal with a banquet; said he, "Faith is bankrupt." Science does not teach that doctrine, and we hope it will never become exact and settled by driving the Christian religion into bankruptcy.

The remark coming from the source it does, and received unrebuked by the illustrious company to whom it was addressed, is a dead weight to science, and has a tendency to bring bankruptcy upon a pursuit that never claimed, nor ever will claim, any authority to meddle with the articles of revelation. It is a dead weight because the world will be confirmed in the belief that science is skepticism, and that philosophy is the Lethe to the human soul.

The injury that scholars inflict on science by meddling with theology is immense, but what tongue shall describe the havoc to free thought and truth, that bigoted enthusiasts have wrought in the name of religion? The highway of knowledge, that was once obstructed with the rubbish of ignorance and superstition, is strewn with as many martyrs to science as there are martyrs in sacred memory. Old notions and old ignorances were displaced in the face of as much opposition, and with as much suffering at the hands of ecclesiastics as was the faith of the early Christians at the hands of the relentless mob.

Not having the time to enter into a connected historical narrative of this battle of the jealousies that began with religion, let us select for our purpose a few noted and familiar instances wherein religionists have acted as dead-weights to science. I barely mention the shameful death of Socrates in consequence of religious jealousy, of the slavery of Plato by a bigoted monarch, of the flight and expatriation of Aristotle through fear of the haughty priests of Ceres. An almost inexhaustible amount of matter bearing on our subject might be taken from the ante-Christian history. Let us, if you please, take for our illustration more modern examples and those coming under the era of the Christian religion.

It is impossible for us, at this time, to consider all the causes which led to the decline of letters and the consequent thousand years of ignorance and crime, called the Dark Ages. But we may briefly examine the last act that smothered out the last embers of expiring learning. Most historians agree that the destruction of the Alexandrian Library was the last deed that led to the final doom of letters. This celebrated library was the only remaining land-mark that stood like an oasis in the great European desert of ignorance. It was filled with 200,000 volumes, and it was the only collection extant of that age, and the ages which preceded it. In connection with it was an academy of science; a school of fine arts, with the largest collection of the finest statuary and paintings in the world; and a large collection of mechanical and mathematical instruments. With some of these instruments Eratosthenes had measured the size of the earth, with others Timocharis had determined the motions of the planet Venus. This gorgeous temple and its rich stores of wisdom bid fair to avert or live through the night of intellectual gloom that then shadowed the land. Where is it to-day? It has gone down to oblivion under the ban of ecclesiastical jealousy and hate.

Theophilis, the archbishop of Alexandria, under Constantine the First, A. D. 390, grew jealous of its fame, and feared it because it was pagan. By an edict from the emperor the torch to books and paintings, the hammer to the pillars and statuary, and the sword to the philosopher, effectually and forever destroyed this monument of Pagan science and art.

As if the more effectually to smother out the few remaining embers of science, another ecclesiastical outrage closely followed the destruction of the Alexandrian Library. Theophilis was dead, but not his creed. He was succeeded by his son Cyril, a child worthy of his sire, a covetous, haughty and vain priest, who was toadied into the belief that he was the most eloquent orator in all Greece. "Among the cultivators of learning and Platonic philosophy, whom the times had left, there was a beautiful young woman, Hypatia, the daughter of Theon, the mathametician, who not only distinguished herself by her exposition of the New Platonic and Peripatetic doctrines, but was honored for the ability with which she commented on the writings of Apollonious and other geometers. Each day before her door stood a long train of chariots; her lecture room was crowded with the wealth and fashion of Alexandria. Her aristocratic audiences were more than a rival to those attending the preaching of the archbishop, and contemptuous comparisons were instituted between the philosophical lectures of Hypatia and the incomprehensible sermons of Cyril."

Here is a conflict, with Greek philosophy under the form o Hypatia, and ecclesiastical jealousy, ambition and power under that of Cyril. This settles it; besides she is a woman. The ecclesiastics were taught to believe that it was woman who first tempted man to partake of the forbidden knowledge. Hypatia is a woman, and behold, she imitates her wicked mother Eve by teaching man knowledge. Scripture for her condemnation. Pile on the dead weights!

Theology still condemns woman from the same causes which Cyril did. The false interpretation of the Christian religion leads man to array his jealousy, his ambition, and his power against woman and her natural rights. Woman, that nursed the manger-born Redeemer, that was 'last at the Cross and first at the tomb," is doomed by the high potentates of that religion to an inferior place in the church, because she was made last and sinned first! Society takes up the cry, and she is refused those temporal rights, which man arrogates to himself alone, because, forsooth, man was made first and sinned last! And with shame and sorrow may it be said that school directors in imitation of this unchristian spirit, accord female teachers inferior places and inferior wages, for the same amount of brain and work—because she is a woman. What a sneaking, cowardly, and contemptible doctrine, to teach under the pretense that it is of divine origin!

The historian goes on to say that, "as Hypatia comes forth to her academy, she is assaulted by a mob, an Alexandrian mob of monks, is dragged into an adjoining church and there killed by the club of Peter the Reader."

Close now the volume of history, and tell me what shall be your verdict against the intolerance and persecution of the theologians of those days? Thus, A. D. 414, the last spark of learning was put out by the high prelates of the church, and for more than a thousand years the leaden pall of mental darkness engulfed the earth in crime and woe. It was well for science, that, on the distant shore of the Red Sea, an Arab and Mahommedan, Tycho Brahe, by his shining scimitar, guarded one altar of knowledge that made Arabia the custodian of the remnant of learning through all those sorrowing ages. This persecution by the theologians drove learning out of Europe into Arabia, where Mahomet gained the advantage of its power—an advantage that Christianity had not, and an advantage that she never regained until science awoke to her rescue ages after. Thus Mahommedanism had ten hundred years the start of Christianity in the race for supremacy and conquest. Mahommedanism owes its prosperity to-day, in a great measure to the dead weights that ecclesiastical bigotry and persecution hung to the car of science.

That justice may be done, it must be admitted that an accidental property of the religious form of worship made it necessary for the priesthood to possess a certain amount of learning, including a knowledge especially of the Latin classics, to enable them to perform their religious rites which were conducted in that tongue.

And now let us turn our eyes to the awaking of learning, and see how much aid theologians gave to its arousing from its long sleep. Religious fanaticism and persecution helped to kill and bury philosophy; will theologians help to raise it from the dead?

One of the earliest beams of dawning intelligence that was the harbinger of the day of reason, was the inquiry into astronomy. The Arabians had preserved and more fully developed the knowledge of the heavens, under the Ptolemaic theory. This system taught that the Earth is the centre, around which revolve the sun, moon, and stars, and was sanctioned by the church as being most consistent with the Bible. From Arabia this teaching gradually spread over Europe, in the fourteenth and fifteenth centuries. Copernicus, who lived in the beginning of the sixteenth century, began (humbly and feebly, it is true) to dispute this theory. If any man before his time had conceived of a more plausible theory of astronomy than the Ptolemaic, fear kept him quiet. Fear! What fear? The fear that any other theory might destroy the Bible! Yes, *fear!* For the theologians shook their threatening scourges at any sun that might dare to conflict with the sun of Joshua at Gibeon, or the moon that stood still in the valley of Ajalon. Copernicus discovered the true system of motion for the heavenly bodies, but he had tact enough to keep it quiet, until, when on his death-bed, his book, teaching the motion of the heavenly orbs, was placed in his dying hands, and he rejoiced that he would soon be beyond the chains and knout and bastile of an intolerant priesthood. His book was rejected and interdicted. The dead weights of ecclesiastical jealousy were heaped upon it. This Copernican system which we know to be true; which is so reasonable and so verified by experiment and observation; and which would have been adopted at that day, but for fear that it would conflict with revelation! Thus do we

behold, that at the grave of the resurrection of science the ecclesiastic placed his iron heel upon the neck of reason!

Galileo, who lived in the beginning of the seventeenth century, boldly taught that the laws of nature were opposed to the Aristotelean philosophy; and Ptolemaic astronomy. He said not a word against revelation or theologians; he taught only that the Ptolemaic theory was false, and that the Copernican system was true. This bold denial of the old, and valiant defence of the new, doctrine raised such a storm of abuse that, in the language of the historian, "the bigoted monks charged him with heresy, and he was twice persecuted by the Inquisition, first in 1615, and again in 1633. On both occasions he was compelled to abjure the system of Copernicus; but it is said that in the last instance, when he had repeated the abjuration, he stamped his foot on the earth, indignantly muttering, "And yet it moves." Yes, in spite of your dead-weights, the Earth still moves, and reason with it!

The labors of Copernicus, Galileo, Kepler, Newton, Herschel and their co-workers are nearly complete; and we of the nineteenth century can now investigate their labor, and comprehend the actual laws which govern the earth and all heavenly bodies. When viewing the stupendous machinery of the sky, we wonderingly exclaim 'Is it possible that man ever believed in any other than the Copernican system? And is it possible that it was once feared that this system might conflict with the Bible, and even dethrone God himself?"

Instead of modern astronomy invalidating revelation or detracting from God's greatness, it adds a thousand-fold to them both in the appreciation of man.

"What though, in solemn silence, all
Move round this dark terrestrial ball;
What though nor real voice nor sound
Amid their radiant orbs be found;
In reason's ear they all rejoice,
And utter forth a glorious voice,
Forever singing as they shine—
'The hand that made us is divine.'"

In this same system of astronomy, against which the ecclesiastic battled with the scourge of the Inquisition, we see exemplified on the grandest scale, law, order, system, design, harmony, and immensity. While the old system of Ptolemy was puerile, and only excited doubts, disbelief, and contempt; on the other hand, the study of the sidereal heavens, under the Copernican system of the countless worlds rolling on in silence, grandeur, and majesty through the fields of immensity, is one of the best schools to teach and impress upon man the fact that some omnipotent and omniscient agency designed, created, and sustains this marvelous procession of shining suns and rolling spheres.

But see, on the hill over-looking this city the astronomer has built his watch-tower, and he stands as a sentinel to signal the march of the armies of the sky. Observation and experiment have taught him that, at a certain point in the heavens, the moon will exactly come between the earth and the sun. He sets to work and computes the exact month, day, hour, minute, second, at which this relation shall occur. With calm assurance he watches and waits, and at the predicted time he sees his calculations verified. While the blind priests lead their blind in the darkened church, the astronomer looks up to the light of God, and seeks for an explanation and safety in the presence of that Being who is the author of faith, and the object of reverence and awe and worship.

He goes before the world, he preaches his revelation, the revelation of reason, the only revelation that science as science can sanction. He tells them the causes of the eclipse; he foretells others; the prediction is again verified, and the world no longer gathers around the priest and the altar for explanation in physical phenomena. They flock to the scientists and there are assured that an eclipse, so far from being an object of terror, is but the manifestation of the wisdom and power of God.

The Church pretends to be the champion of learning and the promoter of civilization! Was it science or theology that computed eclipses, and, by demonstrating that they occur in conformity with a beautiful system of natural law, thus robs them of their popular terror. Was it the astronomer or the theologian who demonstrated that those mysterious bodies, the comets, whose erratic plungings through space once spread consternation far and wide, move in cycles as well-defined as planets, and are themselves as harmless as the moon under whose mellow ray the lover pledges his troth plight to his fond Juliet.

A fine picture might be drawn just here, but I forbear. I am constrained to point out to you two scenes. An eclipse approaches. The priest-ridden and superstitious people of a large city see with alarm the gradual extinguishment of the sun's disc. In consternation they flock to the church; they gather around the priest for consolation, advice, and safety. What can *he* do for them? What *does* he do? He prays. The people pray. They build beacon fires, they gather around the holy altars, they scatter ashes over their heads, they beat their breasts, they howl, and they bend their heads in the dust. While these rites are going on, the eclipse goes off, and behold in answer to prayer—a miracle!

The natural history of man has, for obvious reasons, occupied a large share of the interest of the scientific world. In Christian countries there are two prominent doctrines held in regard to man's origin. The oldest theory is that which we may call *specific formation*, which is taught in the book of Genesis and adopted by a vast majority of theologians. The other and latest theory is that which we may call *developmental formation* or *evolution*, as taught by Darwin, and adopted by a majority of scientists. For the sake of brevity, I shall speak of them as the Mosaic and Darwinian theories. The Mosaic doctrine, as understood and interpreted, is opposed to Darwinism in this: It holds that God created man by specific and miraculous power; whereas the latter holds that man was created and developed by slow gradations, in accordance with the general and established laws of nature. The two doctrines are very different and distinct. Therefore they cannot both be true, for our second proposition says *that one truth must conform with another, and all truths must agree with one another*. One theory, then, must be false. Is either theory true? Theologians contend that their theory is true.

Before we enter into an examination of the arguments *pro* and *con*, or the bearing of the argument upon revelation, let us consider for a moment the motives for believing either doctrine. And first, the theologian's motive. They and all of us have been educated from our cradle up, to believe in the Mosaic theory of man's creation. And never did poet hit the nail of conviction so plainly on the head as when he wrote—

'Tis education forms the common mind
Just as the twig is bent the tree's inclined.

In addition to the motive arising from early education, they believe in the Mosaic theory from fear that Darwinism may conflict with revelation. They fear it, as did the monks the Alexandrian library, as did the priests the Copernican system, as did the ecclesiasts the principles of geology. These, then, are the main-springs of their motives—early education and jealous fear. The motives at once destroy the weight of any arguments they may bring, for if the motives are unreasonable, the arguments to sustain them must also be unreasonable.

What is the motive of the scientists? Simply to arrive at the truth, the whole truth, and nothing but the truth. The righteousness of the motive is self-evident.

In comparing these two motives—and keep in mind that I am not now speaking of the arguments *per se*, only the motives—it must be insisted on that the scientist has no right to allow early prejudice, jealousy, fear, or any improper motive whatever to direct his inquiries or bias his judgment. It must further be insisted upon that Darwin does not claim that his theory is an established fact, only a probable fact. It may be further added that all former fears of the ecclesiastic, that science would conflict with revelation, have invariably proved to be unfounded; and reasoning from what science has done to what science will do, we may reasonably conclude that it will not in this trial destroy the Gospel plan of salvation.

Having disarmed your fears, I hope, of the destructive tendencies of Darwinism, let us look at the general arguments that make its truth probable, and ascertain how it may conflict with revelation. It will be an aid in our inquiry to adopt some convenient and reliable measure that will prove the correctness and value of any given argument. Let us adopt for this standard a *single unit*, OF THE UNITY OF LAW. The tendency of all physical science is evidently toward the unity of all physical law. The oneness of many principles which once were supposed to be separate laws, is verified by experiment and observation almost daily. Heat, motion, light, rest, electricity, vital action, indeed all phenomena of nature are now recognized as allotropic conditions, or as it is called *conservation of force*. If they are all identical, they must all be in subjection to the same law. The coal that for ages lies buried in the hills; the locomotive that thunders through the valley; the daisy that opens its velvet petals on the mountain side; the march of armies and the shock of battle; the lightning flash; the sigh of the sleeping babe, and the blush on the maiden's cheek; and the diamond star that flashes in the hilt of Orion's sword, are but so many manifestations of one and the same law. Even theology gravitates toward the unity of law. A manifold redemption in one; three persons in one Godhead; of one blood all the nations of the earth.

This unity of law is becoming more and more apparent as man ascends in the scale of intelligence, and no doubt, had we the perceptive capacity, we would find that all creation is narrowed down to a monarchial government, and regulated by one law.

What simple grandeur and inscrutable wisdom is evinced by the contemplation of the fact that Deity governs the material universe in all its intricate complexities by a single law. We admire the ingenuity of man, who by his wonderful contrivances is enabled to stand at the helm of a vessel, and by his guidance controls all the complicated machinery that propels it. The engine is driven, increased or diminished in speed; now forward, now reversed; the furnace is now cooled, or glows with increased heat; the whole ship trembles under his control, and speeds with safety her path along the highway of the seas. How much more wonderful and admirable the Agency which directs and controls the illimitable machinery of the universe by unity of law. Without deviation or shadow of turning this Universal Law rolls the planet in its mighty orb, or mantles

the cheek of beauty with a blush; impresses the lion with rage, or tinges the violet with exquisite beauty; stamps the intelligence of man with thoughts that burn, or guides the brute by instinct. Illimitable, unvarying, inscrutable, supreme, and universal law; a theme that angels might ponder with wonder, admiration and awe!

Observation, experiment, anology and every avenue of reason leads us up the single centre—*the unity of law.* Then all things must have been created developed, and now exist in subjection to that law. Man, too, must have been created, and is created in conformity with the same law. Then, he was not created by specific miracle

But did God create the earth and man first, and afterwards make the law which was given to them? I would not detract from our reverence for His wisdom, to argue this silly question. Besides, the world was made five days before man. It must have been governed by law during that interval, and in addition, man was the last work of creation. and if law was made after man's creation, then he was not the last. And now we come to the all-important query: If law existed before man's creation, why the necessity for miracle? The law was sufficient, and has ever since been sufficient for his creation; then wherefore the miracle? God performs miracles only when the natural laws are unable to do the thing He wishes. There is not a single miracle in the Bible but was a miracle by necessity, because physical law could not perform the work executed by the miracle.

I will not enter upon an inquiry as to the ability of law to create man upon the development plan. As far as God is concerned in the work—and He did it all—it was as easy for Him to create man in a gradual manner, by slow degrees in conformity to law, as it was to create him perfect and complete in all his parts at one word.

I shall now hastily complete what I have to say upon this subject, by comparing the two theories in their bearing upon revelation.

When you are taught that God created man by a specific miracle you are impressed with the power of God, and look upon the fact with fear and awe. When you are told that God created man in conformity with universal law, you at once seek to investigate the probable manner in which, by a slow but sure gradation of development, man arrived at his present maturity, the paragon of animals. The belief in the Mosaic theory stops at once all further inquiry, the belief in the Darwinian theory opens up the whole flood-gates of investigation, reason and intelligence. In this investigation you behold every stage of development stamped with the seal and authority of a Supreme and Universal law. You discover that it offers no conflicting exception to the plan of creation. it demonstrates unity of design, unity of action and unity of law. You turn away from it overwhelmed with its beauty, its simplicity, and its grandeur: and to your emotions of fear, and awe, you add those more religious emotions of adoration, humility and reverence. Which of the two systems impresses us most with the greatness and goodness of God—the one in which there is power, or the one in which there is power, intelligence and consistency? As the Copernican system of astronomy magnified our appreciation of the power and wisdom of the Deity, so does the Darwinian theory enlarge our ideas of his inscrutible greatness and intelligence. The Darwinian theory when fully understood will aid in Christianizing Christianity.

I beg of all my hearers to lay aside all opinions and prejudices acquired by former impressions, and look this problem fairly and squarely in the face. I appeal to you if science has ever avowed its intention to destroy revelation. As the Gospel banner is emblazoned with the words' Faith and Peace, so is the escutcheon of science adorned with the words, Reason and Truth. With no conflict in heraldry, with no conflict in design, they should march side by side in unison with the music of the morning stars.

DISCUSSION.

Prof. Brooks, of Millersville, said the paper was thoughtful, suggestive, and impartial. The truth that there has sometimes been a conflict between science and theology is apparent. But Truth is dual, and presents different sides as we view it from different points; and in considering this question it has been looked at from opposite sides. It will he found, however, by the careful student, that the harmony between the two overbalances the antagonism. Indeed, we most frequently find them united. Back in the earliest times we find the great religious teachers were also the leaders in scientific thought. Among the ancient Persians and Hindoos, the priests were the men of science, as may be seen by their sacred books, the Vedas and Zend-Avesta. The Arabic numerals and system of notation are found among the sacred writings of the Hindoo priests. In Christian history the same connection appears. Tycho Brahe, perhaps—Kepler, certainly—was a Christian. If all the scientific men of this and past ages could meet in convention, their chosen chairman would be Isaac Newton, a Christian. Herschel and our own Mitchell, who contributed so largely to scientific investigation, were deeply religious. It was the Church which preserved science during the dark ages. It was from the religious schools of the Saracen in Spain that the theological students of Germany and France brought the knowledge of Arabic numerals to northern Europe. Thus, if the conflict of theology with science is written upon some pages of history, their harmony is recorded oftener and in brighter characters. God is the author of both science and religion, and properly understood they cannot conflict. If there were no other evidence that the Bible is true, the light thrown upon its pages by the discoveries of science would stamp upon it the impress of Divinity.

Dr. W. C. Cattell, President of Lafayette College, said he was surprised to find the paper devoting so much time to theologians and so little to theology. Of course we all admit that as science progresses we are called upon to re-adjust our interpretations of Scripture; but the greatest proof of the inspiration of the Bible is in the fact that only the interpretations are upset, while the original remains untouched. Religion is the subject upon which men think most deeply—to which they give themselves most entirely; and, of course, they are likely to go to extremes, and have done so. Did the Doctor suppose we had not heard all this before? When we are told that the facts of science conflict with theology, it is well to ascertain first whether they are facts. As to Darwinism, it may be well for the skeptical to remember that Agassiz, who stands head and shoulders above Darwin (and who has never been rejected from a learned society, as happened recently to the latter gentleman) does not believe that we are descended from the monkeys, but that we are the children of "Our Father which is in Heaven." We should respect and sympathize with those who are in earnest, though

they be wrong; but when Darwin is set up to overthrow the whole inspired record, then it is fair to reply that Darwin has not been crowned king of scientists, and to quote against him an abler man (Agassiz) who is not evangelical either, by any means. There are too many who undertake to discuss this conflict between science and religion who have no knowledge of either. It is not best to confine the discussion entirely to either scientists or preachers, who each know one side; but the difficulty is increased when those who know neither undertake the business. The lecturer to-night, however, gives evidence of having read outside of his profession. But we take issue with him here, and throw down the glove for his acceptance. It is the animating spirit of Christianity that has wrought civilization. There is only one-fifth of the world that is fit to live in, and that fifth is Christian. He had seen many of the other parts, but nowhere any place that he would be willing to live in. Why is this? China had a civilization and a literature thousands of years ago, when the rest of the world was in ignorance—why did it not develop into universal conquest? That civilization exists to-day, almost unchanged; and the best commentary upon it is the fact that we are afraid our institutions will be corrupted when a few of them come to live among us. We cannot fail at last to acknowledge the power of Christianity, in all the grandeur of its high and noble mission, to prepare man for *both* worlds—in the words of its founder to his apostles, to "heal the sick and preach the Gospel." Where Christianity is, there only are homes, schools, and monuments of beneficence. It is a mistake for skepticism to say that "the church retarded civilization." A certain portion of the church may have done so; but the whole church—the true Christian men and women of all denominations—have always been with it and a part of it. He did not see how so well informed a man as the lecturer could doubt or question this for a moment.

Prof. A. Burtt, Pittsburgh, agreed with much that had been said, but differed with some. That he might not be misunderstood, or misrepresented, he would say at starting that, in what he understood to be the teachings of the New Testament—the precepts and example of Jesus—he fully concurred; holding that, in a proper interpretation of the religion there taught, nothing would be found that would operate against progress in science or anything else that was calculated to benefit the race. If *that* be Christianity, there is no difference between us. But, as he read history, in the fourth century there was brought into existence a religion that called itself Christianity—taking much from the ancient heathen philosophies, and little from the Nazarene but His name. When it is denied that *that* religion caused the Dark Ages and retarded the progress of the world a thousand years, there is a question between the gentlemen here and the statements of Draper, Buckle, Guizot and the other great writers on the subject. He confessed himself too ignorant to decide, as he had not been present in the past to have personal knowledge of the facts. At the same time, he thought those men who had spent years in collecting the facts and handed them down to us, were as likely to be right as the gentlemen upon the platform. The Christian emperor, Constantine, declared that "secular learning is sin;" and the monks added, "cleanliness is self-indulgence, and self-indulgence is sin." This kind of teaching produced such a sentiment that men revelled in ignorance and filth for near a thousand years. From Constantine to Luther, the Church taught as she pleased, and compelled men to act as she taught. He did not dispute that only Christian countries were fit to live in; but who would not have liked to live in the Dark Ages when the Church was all-powerful? The condition of things only began to improve when skepticism manifested itself. All we have that is good and great has resulted from skepticism; the man who does not know that should read his history again. Luther, the skeptic and heretic, gave us a new era. Copernicus and Galileo were skeptics as to the Church's teachings, and new and great truths were ushered into the world. Magellan committed sacrilege when he skeptically set out to circumnavigate the globe which the priests taught was a flat body. And even here, we heard not long ago a venerable man who stands very high in the Church (Dr. McCosh) say that no religious teaching should operate to prevent the scientist making the most searching investigation into the great book of nature.

It was once believed that the earth was made in six days; now many believe that the nebular theory is true, and that the earth has existed for millions of years; and if that should be proven to be true, it would be foolish to say that there was a divine revelation to the contrary. Is that skepticism? If not, it follows that if Darwinism is inves-

tigated an scientifically proven to be true, it will be "foolish to say that there is a divine revelation to the contrary" The reference to "monkeys" is an appeal to human weakness. If it be proven that the Divine Being has brought us up from the lowest form of life to our present high position by the law of development, will it not be as honorable to Him as if we admit the necessity of His performing a miracle every now and then? And if so, why should we not receive it? He agreed with Huxley, who said he would as willingly believe that he ascended trom the monkey as that he *de*scended from Adam. Knowing that the same Divine Being made man and nature, it would seem reasonable to believe that it is for man's best good and the Creator's highest honor, that we should try as far as possible to read aright His works. And when we hear the discoveries of scientists denounced or ridiculed, we are compelled to believe that we see not the Nazarene, but the cloven foot of the theologian. All candid investigation results in good, and he who would attempt in any way to restrain or cripple it is not fit to have charge of the young. Descartes says that all investigation should start in universal doubt; and history proves that intelligent skepticism has been the basis of all progress.

President Hays was called upon for his views, and said he agreed with those who had said the scientist should carry his investigations to their fullest extent. It is, and ought to be, a matter of indifference what anybody thinks or believes, if we can get at the facts. He did not feel at all scared about the results of any discovery in scientific truth. His objection to the lecture was that it seemed to embody, though not stating it in words, some such proposition as this: "Copernicus, Galileo, Kepler, and others—scientific men—were persecuted by certain theologians; therefore, all theologians persecute all scientific men." That, he thought, was "putting it rather strong," when we remember that nearly all the persecuted were Christians—he wished we were all as good as some of them. His objection to Darwinism was not that it would disprove the Bible, but that he wished to preserve some respect for his ancestry, (he differed in taste from Prof. Burtt); but if the theory be proven to be scientifically true, he was ready to swallow it—baboon, crawfish and all. The world is more concerned about man's ascent here and hereafter than about his descent in the past. The Darwinian theory is that animal life became so reproductive that there was not room for all, and the stronger individuals of each species destroyed the weaker, and by mating with each other produced offspring superior to themselves. Now, that is a strange way to improve the breed. How would it do to try it on sheep, for instance—by putting more on a pasture than there was room for? It seemed to him that reason and experience alike teach that the more you crowd them the worse they will get—whether men, baboons, dogs, or anything else. Development in that way perplexed him. And just here Huxley finds another trouble—that Darwin makes allowance only for quarreling between individuals of the same species. If there were so many hawks that there was not food for all, they would not go to killing off one another until they had first destroyed every single chicken. Thus the stronger species would utterly extinguish the weaker; yet, as a matter of fact, we find the weakest of them still represented. Hence says Huxley: "Whatever theory is adopted, it must satisfactorily account for the continued existence of the most primordial forms of life." And Darwin does not answer. Before Bible readers get scared at Darwinism, they had better wait until the scientists have settled their own quarrels. Let them settle this scientific question upon a scientific basis, considering all the facts; especially let them remember that at present none of this Darwinian crowding is going on, but all species are living together in a sort of "happy family." So far as he could see, he believed with Agassiz that all these relations were adjusted by intelligence, and not left to the blind law of a "struggle for life," The opposition to the paper was caused, not so much by the sentiments it contained, as by an inapt use of words—using them in a peculiar sense. For instance, Mr. Burtt called Dr. McCosh a skeptic. That would startle the old gentleman—he would feel discouraged. And Luther's very bones would shake if he could hear it. Yet, as the word was used, it was perfectly harmless. When skepticism signifies only that a man shall ascertain the facts and weigh the arguments for himself, we are all skeptical. But Dr. Cattell had used the word in its restricted, technical sense, and no doubt most of the audience would so understand it. We should not disagree very widely if the terms were defined. Let us all try to look beyond our prejudices and see these two points: 1.—That all truth is one—harmonious and symmetri-

cal, and always agreeing with itself. 2.—That we are bound to search for the truth, simply, straight-forwardly and honestly. When we do this we shall find truth above us, around us, within us—in this life and the life to come—perfect and harmonious—the offspring of the God we worship.

A gentleman, whose name the reporter did not hear, said that, in the cases of persecution quoted, the persecutors were not only churchmen but scientists. The scientists of their times persecuted Galileo and Copernicus. It has generally been a conflict between scientists, rather than with theologians. Darwinism has been banged about by scientific men in all quarters; churchmen have had nothing particular to do with it.

The closing of the debate was accorded to Dr. Wood, who said that he felt very happy with the manner in which he had been treated. He had expected to be thrown out of the window, and carried home on a shutter; for he felt that the prejudices of the audience were against him. The gentlemen who had offered criticisms, had been for the most part reasonable, and be assented to most they had said. In regard to Darwinism, the object of the address was not so much to argue in its favor, as it was to condemn the opposition of theologians to it from jealousy or fear that it could conflict with the plan of salvation. He had no such fear. And if Darwinism should prove true, what then? The theologians seem to say that, if true, it will be fatal to revelation; and if it prove true, where are they? He could answer for himself that he was prepared to believe that Darwinism will not conflict with revelation, and that it will only add to the beauty and force of true Christianity. He thought this gave him the advantage over many theologians. In regard to the knightly challenge of Dr. Cattell, he would accept it, if it was offered with the right understanding. But he denied that he ever said that Christianity was not the promoter of civilization. What he did say was that the *Church* had rather retarded than accelerated civilization. We have a most striking example of the effects of the Church in the Middle Ages. The Church was absolute master. And what did they give us in the way of civilization? Did they give us an Archimedes, a Euclid, a Plato, or an Aristotle? There is a dark chasm of two thousand years between Hippocrates and Sydenham; two thousand years between Archimedes and Newton; and it was two thousand years from the time that Hero revolved his first steam-engine in the Serapon until James Watt re-invented it and revolutionized the world of industry. The gentlemen (Dr. Cattell) has said that there is no country fit to live in but Christian countries. It would seem, if this were true, that the more Christian a country the fitter it is to live in. Spain is the most Christiain country on the globe, so far as Church influence, authority and government are concerned. And yet it is not a very healthy place to visit at present. Indeed the intestine war, and the treachery of the Spaniards would make a visit to China a more pleasant one. We are happy in this country, only because the Church has no authority in the State. If the Church—any denomination of it—had possession of the government, history would only repeat itself, by giving us persecution, intolerance, and crime.

Mr. James G. Clark, of Syracuse, N. Y., was called upon to sing, and prefaced his song with the remark that he could never see any more conflict between science and religion than between a man's body and his leg, because one went ahead of the other as he walked. He then (very appropriately) sang "When the Mists have Rolled Away," and, being encored, responded with the "Evergreen Mountains of Life," of which piece he is the author.

Prof. J. W. Shoemaker, of Philadelphia, was requested to read a selection, but excused himself on account of the lateness of the hour. The audience insisted, however, and he read "The Old Man in the Model Church."

Prof. True sang "The Lost Child"—and found it.

After announcements of committee meetings, adjourned to 9 o'clock, a. m.

THURSDAY MORNING.

PRAYER was offered by Dr. Cattell at the opening of the session.

The programme called for a report by State Superintendant Wickersham upon a uniform plan of granting certificates to teachers, but the gentleman explained that when this matter was spoken of at Philadelphia, it was agreed that Dr. B. F. Taylor, of Chester county, should prepare the report. That gentlemen being absent, and forwarding no report, the subject was not taken up. Dr. Wickersham explained that his absence from this meeting had been occasioned by the State Convention bringing

so many persons to the capital who had business with the School Department. He had come here at the earliest possible moment.

President Hays referred to the absence of Mr. Horton, of Williamsport, who was announced to read a paper on High Schools. He had especially desired that this question should be discussed here. At the National Association at Elmira, Dr. McCosh had called attention to this subject, and a committee was appointed to report next year. We have on one hand the common school; on the other, the college and university; but in a large portion of the country, there is a gap between the two. How shall it be filled? In some places the high schools of large towns meet the want in a measure; in others there are academies; sometimes the two conflict with each other; and too often there is neither. Where there are no high schools, academies seem to be a necessity; where we have such schools, shall we so modify their curriculum, that they will prepare pupils for the Freshman class in college, or shall we es ablish intermediate classical academies? We want information on these two points: 1. What modifications would be necessary in the high schools, and what would they cost? 2. What amount of permanent endowment would secure the continued efficiency of academies? The mass of students in the colleges come from the country, where there are no high schools. Superintendent Jones' report recommended the establishment of high schools by every one, two or three townships; that would be a good plan where it is practicable. What we need is, to bring together information with regard to the different wants of all sections of the country. The experience of Massachusetts was that high schools and academies are both necessary. Dr. McCosh recommended that the public lands be used for the support of higher schools, and the appropriation to be as large an amount as the locality itself would contribute. The want of the times is better preparation of youth to receive college education, rather than ability to give it. You cannot raise the college course higher than the point where its lower end rests on the academic course. West of the Mississippi, where they have the advantage of our experience, we may see the whole system growing up together with a perfect connection—common school, high school, college and university; but here and now the intermediate and academic school is necessary.

Prof. Edward Brooks, Millersville, read a paper on the question, What can Our Schools do to Quicken the Public Conscience?

WHAT CAN OUR PUBLIC SCHOOLS DO TO QUICKEN THE PUBLIC CONSCIENCE?

BY EDWARD BROOKS.

The term conscience, as here used by the Executive Committee, needs no definition. There is in every individual a moral sense, a power of perceiving moral distinctions and feeling moral obligations. This power is one of the primary facts of human nature; it is a sort of spiritual instinct which leads the soul in the pathway of duty. Assuming that there are moral distinctions absolute and eternal in their nature, "great primal truths," as Wordsworth says, which "shine aloft like stars," conscience is the eye of the spirit by which we discern them; it is a spiritual needle which points towards the polar star of virtue and settles in the meridian line of duty. This is what Moore meant in those exquisite lines:

> As still to the star of its worship, though clouded,
> The needle points faithfully o'er the dim sea,
> So, dark as I roam, in this wintry world shrouded,
> The hope of my spirit turns trembling to Thee.

There is a public conscience as well as an individual one. It is sometimes said that corporations have no souls—a thing which we find is often true in fact, though absolutely wrong in theory—and many persons seem to feel that their duties as citizens are not subject to the same ethical standard as their duties as individuals. Than this no opinion is more fatal to the growth of public virtue. The state has a conscience as well as the individual. The Commonwealth is a combination of individuals, and the public conscience is the combined consciences of the individuals who compose it. A citizen does not cease to be a person; a public trust is a moral trust; and political duties are not without the sphere of morality. The question, "What can our public schools do to quicken the public conscience?" is therefore one not impertinent to the occasion upon which we have assembled.

That the public conscience needs quickening is a fact so patent that it needs no demonstration. No search need be made for facts to illustrate it; the events of the last few years are thrusting them into our very faces. Banks are robbed, public trusts are betrayed, widows and orphans are defrauded, legislators are bought and sold, and the springs of official life corrupted. One man steals a great railroad, outrages public sentiment by his open debaucheries, and at a fashionable watering-place shines as one of the "lions" of the day. Another, by the most glaring public fraud, robs a city treasury of millions, and, though made contemptible by the pencil of an artist, still sports his flashing diamond in the faces of thousands whose money was stolen to buy it. A Congressman defrauds the government under the respectable title of *Credit Mobilier*, and when detected in it, endeavors to lessen his guilt by trying to tarnish the fair fame of two Vice Presidents. Ballot-boxes are stuffed and stolen, the will of the people frustrated by false counting, and legislatures bought and sold like cattle in the shambles.

With such facts staring us in the face and growing more frequent every year, it cannot be disputed that

we need a quickening of the public conscience. We need it for the good of the individual, for the purification of society, and for the preservation of American liberty. Thoughtful men are far from certain that the problem of republican institutions is fully solved. A century may find a monarchy, or a state of anarchy, where the stars of American freedom now float so proudly in the breeze. What is the true foundation of our liberties? What is the basis of the permanency of our government? are the questions which American statesmen and patriots are asking to-day, as they did in the days of the Fathers of the Republic.

Permit me to say here, though it may contradict an assertion frequently heard, that the foundation stone of American liberty is not popular intelligence. Mankind may be educated intellectually, and be arrant knaves. Aaron Burr knew enough to be loyal to his country. It was not the ignorance of Louis Napoleon that caused the *coup d'etat* which overthrew the liberties of the French Republic. Fisk and Gould knew enough not to steal,—had they known less they could not have stolen so much, nor kept it so long, nor sent so much of it "where the woodbine twineth" Popular intelligence is only one of the conditions of national existence; the true foundation of a nation is public conscience. The Republic rests in the moral sentiments of the people. Virtue is the foundation-stone of the temple of American freedom.

For the culture of the moral sense of a people the four most efficient agencies of modern times, are the *parent*, the *pulpit*, the *press* and the *public schools*.

Education begins with the parent; our first teacher is our mother. In the rude cradle gently touched by a mother's foot, many a child has imbibed influences that have determined his destiny here and hereafter. Many a soul has been wooed to virtue by a mother's lullaby, which, after running like a sweet strain of music through the life, has been heard in the anthems of praise sung to a patriot's deeds of glory. The heart that throbs in the poet's line, the hand that wields the conqueror's sword, the will that rules a nation's destinies, may have drawn their power from a mother's consecrated life. "A kiss from my mother," said Benjamin West, "made me a painter." The Republic owes almost as great a debt to the mother of Washington as it does to the conquering hero himself.

From the consecrated circle of home the child passes to the school-room; and now the question presents itself, What can our schools do in the interest of public virtue? That they ought to do something, is evident *a priori*. To send a child from the moral teachings of a virtuous home-circle to a public school that affords no moral culture, would be to outrage humanity and jeopardize the interests of the immortal soul. If the parent, the pulpit, and the press labor for the inculcation of moral sentiments, the school cannot afford to be an exception in this great work. Moreover, the public school not only *ought* to do something to quicken the public conscience, but it can do much in this direction. "That which is put into the school," says the old maxim, "will appear in the life of the State." A high standard of ethical culture in our public schools ought to lead to a higher standard of moral action in the Commonwealth.

I am aware that an idea prevails among a large number of educators that it is not the province of the public school to give moral culture; and moreover, that it is not necessary for it to do so, as intellectual culture is sufficient for the ends of morality. Against this position, so full of danger to society and the state, I enter my most earnest protest. The training of the intellect is not sufficient to meet the requirements of the problem of education. It will not be denied that scientific education is good, that science has even a moral mission. The culture of the intellect has been the means of moral progress. The dissemination of scientific truth has done much to banish superstition from religion, emancipate the mind from the fetters of priest-craft, and ameliorate the social and moral condition of the masses. The invention of the printing-press has done more to elevate the condition of mankind than the preaching or legislation of a century could have accomplished without it. The shriek of the iron horse in Utah foretold the overthrow of the relic of barbarism. Every ship that bears a missionary to a heathen country is itself an eloquent missionary, teaching a lesson of civilization, and pointing the astonished beholders to the possibility of a better future. But great as are the benefits of the achievements of science and the culture which it affords, it is not sufficient for the moral progress of the world. Science may surround man with opportunities and instrumentalities by which he may progress morally, when he has desires of a better life, but it does not reach down into the spiritual depths of his being, where motives are generated and aspirations after the better life are formed. Scientific education stops with the intellect; we need a culture that teaches the sensibilities and the will. For the discharge of the duties of life we not only need to know the truth, but the heart should be taught to throb with noble emotions, and the will to act in obedience to the royal prerogatives of duty.

Our public schools should therefore give moral as well as intellectual education. This is a growing conviction in the minds of our ablest educators. Our State Superintendent, who occupies high ground on this question, says, in his able report of 1870, that "the teacher who neglects to give moral instruction with all the skill of which he is master, is recreant to his high trust." Horace Mann, who has left behind him the finest contributions to the educational literature of the country, says, "It is the cultivation of the intellect to the neglect of the moral powers that has brought education into disrepute." And again, "When a teacher fails to meet the intellectual wants of a child, it is the case of asking for bread and receiving a stone; when he fails to meet its moral wants, it is giving a serpent."

For the quickening of the public conscience, therefore, there should be a constant and thorough culture of the moral sense in our public schools. Boys should be taught that virtue is better than learning; that a good act is more worthy of commendation than a well-recited lesson; that to do a manly deed is better than to do a hard problem; that to speak the truth even when a lie will do some temporary good, is more honorable than to speak the best piece on declamation day—,in a word, they should be taught that it is better to be good than to be learned or great. They should be led to prize an honorable reputation and an unsullied character as a thing whose value is above the price of rubies. Constant and unremitting efforts should be made to cultivate in them a pride of personal character, a high self-respect, and an appreciation of personal purity that will be a protection to them in the hour of temptation. I would have the teacher fill their minds with

the noblest sentiments of literature, to cultivate their æsthetic taste, and quicken the moral sense; and hold up to their admiration the noblest examples of moral action, which shall be to them as ideals of excellence ever floating before them and pointing them to a higher life. I would have the common-school teacher aim to write upon every youthful heart, in ineffacable characters, that it may by reflection be seen written on the portal of every life-duty, the sentiment of the ancient maxim, *virtus sola nobilitas.*

But the public school should go even farther than this in its efforts to quicken the public conscience. Much may be done by the culture of the moral nature of the child, but moral culture is not sufficient. Moral education should be supplemented by religious education. By the term "moral," as here used, I mean the doing right from a sense of duty and self-respect, regardless of a belief in the existence of a God or the immortality of a soul. By "religion" I mean the acting under the conviction of the existence of a Supreme Being, whose eye rests upon our actions and motives, and who will reward or punish for the feelings we cherish and the actions we perform.

Remembering that I am treading on debatable ground, I hesitate not to affirm that I believe that moral education is not sufficient. Purely ethical incentives are not strong enough to hold mankind in the path of duty. They must be re-inforced by religious motives, if we would control the heart and actions of the world. Ethical motives are confined to the sphere of nature; religion reaches up into the sphere of the supernatural, and we need incentives from the supernatural to move mankind to the highest life. An appeal to the moral precept carries with it much weight, but the injunction, "Thus saith the Lord," awes the soul into obedience. A belief in God is the highest motive to human action. All nations enthrone the gods in the highest places as the symbols of the most sacred and powerful influences. The Greeks put themselves in the centre of the earth, and in the centre of Greece reared Mount Olympus, where Jupiter issued his mandates and wielded the sceptre of authority. Mankind are so constituted that there must be a belief in God as an omnipotent, omnipresent Being, who searches the hearts of men, to be moved to the highest performance of duty. The so-called great moralists of antiquity, however much it may be disputed, were religious men, men whose lives were controlled by religious incentives. Plato, from whom we may learn a lesson in respect to religious education—for his system of education is based upon a religious creed—says in his Phædo, "The gods take care of us, and we men are one of their possessions." Socrates in his defense says, "O Athenians! I honor and love you; but I shall obey God rather than you;" and Plato puts into his mouth a prayer which, with a slight modification, might be transferred to the literature of Christianity: "O beloved Pan, and ye other gods of this sacred place, grant me to become beautiful in the inner man."

I urge, therefore, for the quickening of the public conscience the introduction of religious education in our public schools. By religious education let it be understood that I do not mean sectarian instruction. Whenever a man says "religion," the first idea that presents itself to the minds of many persons is, What religion? that is, What sect or denomination? By religion, I repeat, I do not mean sectarianism. Sectarianism may be all well enough in its place; with so much variety in the feelings and intellects of mankind, it is a necessity of human nature; but we are told that there will be "no sects in heaven," and surely there should be none in our public schools. By religion, I mean the general principles upon which all sects agree,—the existence of a Supreme Being, the fatherhood of God, the immortality of the soul, the divine sanction of the right and the punishment of the wrong, and the mysterious and vital relation of Jesus of Nazareth to the spiritual life of humanity. It is these general principles of religion that I would have taught to the youth of our country in the public schools. Let the parent and the church build up the creed, if necessary, on these broad principles. Religion education, without a church creed, is a necessity of our system of public instruction.

The fundamental idea which the teacher should labor to implant in the minds and hearts of the rising generation, is the conviction of the existence of God. By this I mean, not a mere intellectual assent to the proposition, but a vital and ever-present consciousness of such existence, so that they may walk, as it were, under the constant control of His ever-watchful eye, realizing that He reads the hearts of men and knows their inmost thoughts. They should be taught to feel that, as Plato says, "The gods take care of us, and we are their possessions;" or, to feel with St. Paul, when he says, "Whatever ye do, do all to the glory of God." Such a consciousness of the ever-presence of a personal Deity would revolutionize the world. Put such an idea into the minds and hearts of the American people, and we could unlock our jails and turn our prisons and penitentiaries into public schools.

This religious education, which I believe to be necessary for the quickening of the public conscience, should be founded upon the teachings of the Bible. As a book written by the pen of inspiration, it speaks with divine authority to the human conscience. Even were its teachings not divine, it would be our best text-book in religious culture, for it is the crystallization of all that is best in the religious faith and feeling of the world. Containing the purest precepts and the loftiest scheme of morals that the world has ever known, it has been a fountain of inspiration for the highest development of human character and the noblest achievements of human action. Even genius has attained its loftiest triumphs in the world of Art inspired by its sacred influences. In adoration of the God of the Bible, architecture erects its highest temples, music breathes forth its most enrapturing harmonies, painting presents its finest frescoes, and poetry creates its sublimest epics. Its influence upon national life is equally strong. The Bible is the keystone of the temple of modern civilization. The nations which to-day represent the civilization of the Nineteenth Century are Christian nations—nations which have drawn their life from the teachings of the Bible.

It is this book which I would make the basis of the religious instruction of the children of the commonwealth. I would read it in their hearing; I would fill their memories with beautiful quotations from its sacred pages; I would endeavor to inspire their hearts with the sacred influences which lift the soul into a higher sphere of thought and feeling. In the far-off land of the Orient, the Arab children are gathered daily in the groves which border the banks of their beautiful rivers and made to repeat choice passages of the Koran, until they linger in their memories like a dream of beauty, and become an ideal of their lives. I would do for the children of a Christian

commonwealth what is done for the children of the land of Mahomet. I would fill their minds with the golden precepts of the Bible, stir their hearts with its lofty aspirations, and endeavor to mould their lives after the pattern of the lowly Nazarene.

In thus urging the importance of religious education, with the Bible as its basis, I am not discussing the question of the regular reading of the Bible in our common schools. The mere question of Bible reading is a very insignificant one compared with the importance of religious education based upon the teachings of the Bible. Such education may be given, if necessary, without a copy of the Bible in the school. It is not a question of the Protestant or Catholic version of the Bible, but one of instruction in the essential truths common to each, for, however, they may differ in details in the broad and fundamental truths they agree. The principle which I advocate is more comprehensive in its scope and far-reaching in its results than any of these. It is the morality of the Bible enjoined by the voice of inspiration that I would have taught; it is the fundamental truths of our holy religion that I would have put into the minds and hearts of the rising generation, until they become inwoven into the very texture of their spiritual natures. Let the public school join hands with the parent, the pulpit, and the press for the inculcation of a purer morality and a deeper religious faith and feeling, and there will be a quickening of the public conscience which will bring forth better fruits in the individual, social, and political life of the state and the nation.

DISCUSSION.

Dr. A. B. Miller, of Waynesburg College, said: "This is a serious question, and might be asked in another form—How shall we preserve ourselves from self-destruction? The evidence of corruption all around us is alarming. In the discussion on science and theology, one fact seems to have been overlooked, that it was Christianity which established the colleges and universities of this land. It is true as some one has written, that infidelity has yet to take its first successful step in the direction of educational progress.

Prof. A. Burtt said the paper had raised a question of the greatest importance, and one which was to him exceedingly perplexing. When we say that we will teach science and literature, or virtue and morality, all thinkers have a definite idea of what is meant by the terms. We have an acknowledged standard of right and wrong, though people do not live up to it; there is that which we regard as virtuous or vicious, and upon it we differ but little. But when we go beyond that, and say, "We will teach *religion*," then we are all in the dark. Whose religion? That of the gentleman from Millersville? Well, if everybody understood the term as he seems to define it, there would not be much difficulty. Belief in God, in the immortality of the soul, in man's responsibility for his deeds—all these any of us would be ready to teach; but, is this religion? Most people would say not. Three-fourths of this audience, probably, would say that such a belief does not make a religious man. When we tell a teacher to teach religion, the word must mean that which he conscientiously believes religion to be. Different sects hold different opinions as to what constitutes religion. Many hold that a certain belief in a Saviour, and in certain speculative doctrines, is necessary to salvation. The Young Men's Christian Association has decided that certain views are "evangelical," and that those who do not hold these are not Christians—excluding the Unitarians and Universalists. The Methodists hold that a certain change called conversion or "the new heart" is essential; if they teach religion, they must teach what they believe or be hypocrites. We have many excellent Roman Catholic teachers; they must teach *their* religion or be hypocrites. And a change of teachers would produce "confusion worse confounded." Does it not clearly appear that if religion is to be taught in the state schools, we must have an authoritative state religion, so that all can teach alike, and no one's conscience be offended. If we refuse to do this, and still insist on religion being taught, we strengthen the hands of that party who would abolish the state schools, divide the school-fund among the churches, and let each conscientiously teach its own doctrines to its own children. He felt the importance of early taking hold upon the religious element in human nature, to promote morality and virtue. But if it is to be done by teaching religion in schools, there are but the two alternatives—a national religion or division of the fund among the churches. It was clear to him that if we teach morality and virtue in the schools, and leave religion to the church and Sunday-school, we shall accomplish both with great success. He did not see any necessity for converting the school-teacher into a minister; let the theological institutions, upon which so many millions are spent, take care of that branch of education. If what he had already given as the basis of morality and virtue, is to be considered as religion, we can all teach that; but if, as the pulpits teach, that is not the kind of religion that will save the soul in the future life, then we cannot teach religion in state schools without first establishing a state church. Unwilling to risk

that, we must divide the fund among the sects, or else leave out all that is technically religious, and confine ourselves to teaching literature, science, morality and virtue. Religion may be safely left to parents, Sunday-schools and churches, whom he considered competent to attend to that matter as well, and better than it could be done in the common schools.

President Hays said that when he was a boy he enjoyed setting animals to fighting, and was annoyed when they wouldn't; and this was a similar case. These denominations that are represented as being antagonistic don't fight worth a cent upon educational matters. We have all kinds of teachers in our schools, and there is no trouble whatever about religion; but when somebody undertakes to shut the Bible out of the school, then you get an interesting little "row" at once.

Prof. Burtt said that was not putting the case fairly. As it is, no religion is taught in the schools; when it is attempted to introduce one, there will be "row" enough.

Dr. Cattell said that Prof. Burtt and himself would agree better on this subject than on most others. This question ought to be discussed by common-school teachers, as they are called upon to meet it. The colleges have plain sailing, because each of them is founded by a particular sect, and teaches accordingly. At his own college, for instance, the control is in the hands of men who believe that morality is not the whole of religion, and that a change of heart is necessary; and though other denominations are represented in the faculty, religion is taken as set forth by the church to which the institution belongs, and so they teach and preach, following the Scripture as they understand it. Of course, they expect every man to be guided by his own conscience, no matter how far he differs from them; but they endeavor to teach the doctrines of the Lord and Saviour, Jesus Christ. But in the common schools, supported by the state, a grave question arises as to how we can give religious training without partiality. It is a question upon which we need more light.

Dr. A. B. Miller thought it neither practicable nor desirable that sectarianism should be taught in the schools. However well qualified the church may be as a teacher of morality, it is a deplorable fact that a large portion of our people never go to church to learn All the children go to school, or soon will; the next generation will pass through the hands of our common-school teachers. We can teach them the morality of the Bible without approaching sectarianism; and, infidelity itself being the judge, the Bible teaches the best system of morality in existence. We need not mention even the fact that there are sects; there is so much ground common to all that the points of difference need not be mentioned in school. He believed it was the mission of the common school to teach the nation that morality without which we cannot hope to leave our institutions as a glorious heritage to posterity.

Mr. L. H. Eaton, Pittsburgh, said if all these teachers were using their best endeavors to teach virtue and morality, what an influence they would exert! The truth is that the moral part of the teacher's work is too often lost sight of. The principles of Christianity are broad and its great doctrines few; and these can be so taught as not to interfere with any sect. God, immortality, future rewards and punishments—these can be dwelt upon without causing any trouble. Let this be faithfully done, and it will result in improving the public morality. We should remember the responsibility of teachers for the moral welfare of their pupils.

Prof. J. W. Shoemaker endorsed the remark of Dr. Miller that infidelity itself testifies that the Bible contains the best system of morality. When Girard founded the college that bears his name he was so careful to guard against sectarian interference that clergymen were forbidden to visit the institution; yet he provided for the teaching of a system of morality. The board of trustees, after a long discussion, was forced to admit that there was no system so broad and complete as that of the Bible. Visiting the institution recently, he was invited to conduct an exercise, and on asking what method he should pursue, was told that he should do as he wished—about as he would do anywhere else. He noticed, also, that the singing-books used were those made for Sunday-school purposes. We must all come to this; we cannot teach a broad morality, that will meet the wants of a country like ours, unless we take it from ihe Bible.

Dr. Wickersham endorsed, theoretically, the position taken in the paper, than which few more valuable were likely to be read here. Practically, there are difficulties in the way of applying it to our system. The schools of a community are the expression of its morality, as well as its intelligence; and in working our school system we must be careful not to violate the conscience of

any man. We must observe our fundamental law, by which the rights of conscience are made sacred; and by paying a proper regard thereto we will find the schools everywhere to be a fair exponent of the average morality and religion of their locality. Surely, we will all agree that the public conscience needs quickening; that is shown by what is taking place in every part of our country, every day in the year. The moral weakness of the times is the love of money, and under its temptations we see many men of good reputation fail. We need to strengthen the back-bone of honesty in this nation. We want conscience in positions of public trust. We want the nation freed from the thieves who are desecrating the temple of liberty. Depravity seems to be sweeping over the country like an epidemic disease; let us hope it is but a temporary affliction that will pass away as it has done in other nations. We can do much in this direction among the nine hundred thousand boys and girls in our schools. If we could do no more than put into every school a high-toned, moral, Christian teacher—one who should embody in his own life the principles of morality and Christianity—we should have done very much towards this needed quickening of the public conscience.

Prof. Brooks defined morality, as he understood it, to be the doing right from natural motives; while religion causes us to act with reference to the Divine eye being continually upon us. Religion he took to include the fundamental belief of all Christian churches—in God, in His providence, in future rewards and punishments. That religious teaching may be broad enough to include all sects, was evident from the fact that in his own school he had seen Catholics, Quakers, and nearly all the other denominations, in the same Bible class. He would teach children to act with reference to God's eye seeing them all the time.

Music followed, by the Allegheny Quartette Club.

Prof. J. A. Cooper, of Edinboro, Pa., read a paper on the subject of Our Normal School Policy.

OUR NORMAL SCHOOL POLICY.

BY J. A. COOPER.

THE Normal School policy of Pennsylvania, as embodied in the Normal School Law and developed in the organization and management of the schools themselves, is in some respects peculiar, being unlike that of any other state in the Union.

It is a permissive policy. The original act of the Legislature—known as the Normal School Act—instead of providing for the establishment of schools by appropriating money to erect them and enacting that schools shall be provided, says: Whenever any number of individuals more than thirteen, shall erect, establish, etc., etc, then such schools may be recognized as State Normal Schools, with certain rights and privileges. So far as the law itself determines the erection of schools, none need be or need have been built. But it gives the people of the state the right to build, and there have been seven schools established under the original act, as slightly modified by subsequent amendments.

It is a comprehensive policy The law divides the state into twelve normal school districts, and provides that one school may be established in each district. No school can be recognized without accommodations for three hundred pupils. Twelve schools, with capacity for three hundred students each, will furnish opportunity for three thousand six hundred students to receive instruction. If half graduate each year, and the course is designed to cover two years of study, then one-half of three thousand six hundred students, or one thousand eight hundred can graduate each year. The normal school graduates remain in the profession, most of them at least for life. Though a larger army of teachers is employed in Pennsylvania—about eighteen hundred, as reported by the school department—yet this army can be kept full by receiving new recruits of permanent members, at the rate of one thousand eight hundred yearly. It is comprehensive in reaching to every school district, however small, by providing that every such district as well as every larger district may send one scholar annually to the normal school.

It is a co-operative policy. It encourages the people to establish schools by making provision for the state to add its authority and give its protection to the schools when the people have erected and established them. It provides that the directors of every district may, and contemplates that they will, send students to these schools. It makes county and city superintendents official visitors and examiners of the schools, and it holds out inducements to teachers to attend them and secure to themselves the benefits of their instruction. Thus, the teachers themselves, the people through their directors, the school directors themselves, county superintendents, and the Commonwealth, co-operate with the contributors to the schools, in maintaining these institutions.

It is a local administrative policy. The whole internal and external affairs of each school are managed by the local officers of that school without any connection with any other schools. The pecuniary affairs of each school are in the hands of a local board of trustees; the teachers are elected by this same board, and its whole management is in their hands; the teachers choose their text-books and their methods of instruction; and the principal of each school is charged with the whole discipline and government of the school of which he is the head. This gives opportunity to adapt the management of the separate schools to the peculiar wants of the people in different sections of our state, and utilizes the peculiar tact and talent of each principal and every teacher in the different normal schools. In conformity to this local administrative policy, it contemplates that every board of directors in the state will provide for its own wants by educatiug teachers for its local schools, and seeing that they teach in their schools after they are educated.

It is a stimulating policy. Giving the largest lib-

erty to the individual schools, and to the separate members of each school, it tends to call out the best efforts of all connected with them in generous rivalry. It reaches down to the teachers of the various districts and calls upon them to do their best in their teaching by specifying that, of those persons who apply to be sent to the schools, the one who exhibits the most tact and talent for teaching, and whose ability indicates the best use of the opportunity for improvement shall be the person sent. It incites its own graduates, as well as others, to put forth their best efforts, by specifying that no graduate can receive the highest degree until after he has taught two years, and that to the approval of the directors by whom employed and of the county superintendent in whose county he was employed.

It is a boarding-school policy. The law specifies that each school must have boarding accommodations for three hundred students. To accommodate this number of persons with play-grounds and yards, there must also be at least ten acres of ground. The boarding accommodations make it possible, and the extent of ground makes it necessary to establish these schools in the country. Of the seven schools organized under the law, not one is in a city or even in a large town. The advantages of a rural location are too numerous and too well known to be presented here. Each school has connected with it a Model School for practice in teaching, and for testing the capacity of students for teaching as well as giving them insuction in the Art of Teaching.

It is an expansive policy. The schools having been erected entirely by private munificence because they were needed in the section where erected, and because it is possible to erect them only where a generous liberality exists, additional wants call for additional supplies and call not to deaf ears. The same generosity which provides for the original establishment of a school, can be depended upon to supply all the legitimate demands of healthy growth. Therefore, while the school reports of some other states show that when repairs and additions are necessary to be made to their institutions, their legislatures are not ready to provide the means unless they are first properly bored—in our own state the additions are made by the community which first erected the institution. Whatever special instruction or special studies are called for by the peculiar wants of the district in which a school is situated are provided for in the same manner.

It is a conservative policy. Though the private affairs of each school are administered by the officers of that school the course of study is the same for all of the schools, The course of study is fixed by the principals of the several schools at a meeting called for that purpose, and approved by the State Superintendent. When once fixed and approved no change can be made without the approval of State Superintendent and a majority of the principals. It follows that, however radical may be the views or notions of some of these principals, no very violent or extreme changes can be made or are at least likely to be made. No doubt some changes will be needed from time to time to meet the wants of our progessive profession. These will, of course, easily be made and approved by the proper authorities.

It is a thorough policy. The course of study as now fixed is less extensive than that in most of the states, but what it lacks in surface it makes up in depth. Thorough instruction is the aim of the instructors of these schools, and were it less their aim than it now is, it would be secured by the system of examination. The students are examined for graduation not only by their own instructors, but by a board of examiners appointed by the State Superintendent, of which board the State Superintendent is himself the chairman. The board numbers five, two of whom must be city or county superintendents, and two are principals of normal schools. No one can receive a diploma unless he is approved by four of the examiners. As four of the examiners are not instructors in the schools, as three of these four must unite in approving all who receive degrees, it follows that no student can graduate unless he shows that his Instruction has been thorough.

It is a policy of fixing responsibility. Every school has a head who is charged with the "whole discipline and interior government of the school." Such are the words of the law. Each teacher is the responsible head of his department, and if there are any weak points in the school, it is very easy to find the same and to fix the responsibility. No one can easily charge the blame of his neglect upon another.

Some of these features have been copied in other states; nearly all of them were new and original with the Pennsylvania Normal School Law; and some few of them are found as yet in that of no other state.

DISCUSSION.

Prof. G. P. Beard said that it seemed to him as if any one who recognizes democratic institutions must admit that all improvements grow largely out of a popular demand, and he who attempts to frame any institution, not so demanded, will encounter failure. The public school finds its warrant to live in a popular demand; so also with the academy, the college, the university. And now that we have come to the time when modes of economizing educational forces are in question, the normal school finds its warrant to live in a popular demand, as the rapid increase of such institutions abundantly proves. The ruling idea of a normal school should be found in the end to be attained—the preparation of the teacher for his work; not to make mechanical teachers, but to make the most of their teaching ability, and realize as nearly as possible the ideal teacher. If it is important that teachers shall have before they try to give, then the normal school must first require scholarship. If the candidates come prepared, it is well; if not, you must prepare them by furnishing them with the subject-matter. When this is done, teach them to impart to others what they have received. The normal school curriculum should embrace all that the teacher can use—all that will develop his natural ability to teach; and it must not be forgotten that part of his work is to exercise a right moral influence. What you want in the school, you must first put

into the teacher. The normal school must teach methods, and give opportunity for their practical application in its model school. He hoped and believed the right of the normal schools to live would be vindicated. That they are needed seems to be recognized; if they answer their purpose, commend them; if not, criticise and improve them.

Prof. Waugh, of Hollidaysburg, said there had been some talk of boring the Legislature. It is said these normal schools manage to get five or ten thousand a year from that body, while older schools are turned away from the doors. If there was any method of boring that would secure an even distribution of the grab, he would like to find out how it was done. He could not understand why these schools should receive state aid, and the Western University be refused.

Mr. H. B. Whittington said one reason might be the lame and inefficient manner in which the private institutions had done the normal work, making it necessary for the state to establish these schools. They receive state aid because they are directly under state supervision. Strictly private institutions, especially those of a denominational character, ought not to ask state aid, and if they do, they should not receive it. The state also reserves the right to have teachers instructed *gratis* in these schools, upon their agreeing to teach for a certain period.

Prof. Waugh replied that these normal schools are private institutions, owned by individuals among whom their profits are divided. If the state must appropriate money to them, let us make one job of it, and not have them under the necessity of boring appropriations through the Legislature from year to year. There is an impression prevailing that they can get money from the state when others cannot.

Prof. Brooks said that each normal school, after coming up to the standard and being accepted by the state, became entitled to receive just $15,000, and no more. With regard to the objection to state aid, he reminded the gentleman that the common schools are not state schools but the people's schools. The people build the schoolhouses, employ the teachers, pay them and supervise their work. The state helps them by appropriating money, because it recognizes the school as a necessity; and does not that involve also the necessity of good teachers? If so, why shall not the state also help the people to establish schools for the training of teachers? The people are equally independent of the state in the common school and the normal school; the state taxes the people, and returns a portion of their money to each of these schools. The relation of the state to each is the same. The state pays for the education of its children to be citizens; and to that end, it pays for educating some of its people to be teachers of those children; the policy in both cases is identical. He would say: Let the state help liberally all institutions of learning except those of a sectarian character which are supported by the church. In conclusion, he remarked that last winter there had been a departure from the general normal school policy of the state, to which the gentleman perhaps referred; he did not approve of it, thought it was merely for temporary circumstances, and would hardly be pursued further.

The discussion having closed, Miss Rose McCleary, of Pittsburgh, by request, read "Mona's Waters."

Prof. True sang a solo.

On motion, an afternoon session was ordered, to commence at half-past two o'clock.

Dr. Wickersham moved that the subject of high schools, and their place in a public system of education, be in order for discussion at the opening of the afternoon session.

Prof. Verrill moved to amend, that Dr. Wickersham be appointed to open the discussion, which was agreed to, and the motion was carried.

The committee on the place of next meeting reported through its chairman, Mr. Woodruff, that several places had been suggested to them—Oil City, Reading, Easton, Shippensburg, York, Wilkes-Barre, and Lebanon—and that after deliberation, they had agreed to recommend that the next annual meeting be held at Shippensburg.

The report was received on motion of Prof. Burtt, who then moved to postpone the further consideration of the subject until the afternoon session.

Prof. Beard stated that Shippensburg is in the Cumberland Valley, forty miles from Harrisburg by rail, a town of 3,500 inhabitants, with three hotels; they could accommodate five hundred visitors in the Normal School building, and one thousand more outside, if necessary. The school would furnish the five hundred with boarding and lodging at $1.50 per day.

Dr. Wickersham asked what advantages had been claimed for Easton, before the committee.

Mr. Woodruff replied that Dr. Cattell, who invited us there, had taken more interest in this Association than any man of his position in the state; that Lafayette College stood in closer connection with the common schools than any other, as the high school of Easton controlled free scholarships in that institution, and sent boys right up; that there was ample hall accommodation, and interesting points in the vicinity to be visited.

Prof. Burtt's motion to postpone was agreed to, and the Association adjourned to 2½ o'clock, p. m.

THURSDAY AFTERNOON.

MUSIC by the Allegheny Quartette Club opened the session.

Dr. Wickersham opened the discussion of the question: "What should be the place of High Schools in a public system of instruction?" After remarking that he had not had time for any preparation on this subject, and could only throw out suggestions in a fragmentary way, he spoke in substance as follows:

None of us doubt the value of higher education, yet we see that the colleges are languishing. The number of students does not keep pace with the increase of wealth and population. In fact, the number in our colleges to-day is not much larger than it was ten, twenty, or perhaps even forty years ago. Now, if higher education is so valuable as we think, there ought to be a proportionate increase in the number; but it is not so. Meanwhile, the common school system is expanding wonderfully. The amount expended for school purposes has increased since 1866 from three and a half to nine millions. The amount expended for school buildings, which up to that time had not exceeded five hundred thousand dollars, has averaged two and a half millions for the last five years, and was nearly four millions last year. The growth of popular instruction in Pennsylvania during the past five or six years has no parallel in the history of any American state. This large expenditure of money is the measure of the popular interest in education; the work stands upon a solid foundation, and it will not stop here, but continue to grow; certainly, there will be no backward step. But our system is not yet filled up. We need a class of higher schools, and these high schools and academies are the subject of discussion this afternoon.

How shall our colleges get students? How shall we provide feeders for them? Where shall we prepare our youth for college? This is not the work of the common school, and we must provide an intermediate class of schools for the purpose. One of the reasons why the colleges have not their proportionate number of students is the decay of their old feeders, the classical academies. These were once numerous; almost every county had one, the larger ones several. But these have nearly all gone out of existence; in the cities the high schools, and in the smaller towns graded schools have taken their place; but these have not the classical spirit of the old academies, and the colleges have lost their main support. It is to this chasm—this missing link—that our attention is now directed. How shall our boys and girls be prepared for college?—for our girls have an equal right with the boys to share in the advantages of a higher education.

1. Wherever it is practicable, we must establish High Schools. We must have a high school in every city, and a graded school in every township; the time is coming when an opportunity must be given everywhere to receive better instruction than is now given in the rural districts. There must be an education broader, deeper, higher, to make full-grown American citizens. This spirit is growing, and finds expression in such institutions as the noble high school of this city. But we cannot have high schools everywhere, and must make other provision for the rural districts.

2. We must have high classical academies. The high school cannot entirely supply the place of these; there is room and work for both. It will be impossible for long years to grade up our country schools high enough to touch the colleges; therefore we need high-grade boarding-schools. The academy must be a boarding-school in sparsely-populated sections, owing to the distance from the pupils' homes. Such schools should be liberally encouraged by the state, and, so far as possible, incorporated into the general system. It would be of great advantage to have these established all over the state by neighborhoods, corporations, churches—any way, so that we have them. They will meet thousands of boys and girls who are ready and willing to take

a higher course, but have not now the opportunity; and the want cannot now be supplied in any other way.

This, then, is the right policy: grade the schools as high as you can in the country, and higher in the city—high enough to touch the colleges—and fill up the gap in the country with the classical academy. We do not agree with those who, at the National Association, at Elmira, the other day argued that the state ought only to teach reading, writing and arithmetic, and a few elementary branches, and that only as a matter of *police policy!* We mean, by God's help, to develop everywhere the highest grade of school possible. And there is plenty of room in our system for private academies, and the State ought to aid them. It will be done some day; we are sowing good seed, which will bear fruit in the future.

We shall promote the prosperity of the colleges by adjusting to them our high schools and academies. At present, few of our high schools prepare the pupil fully for college; perhaps even some of the remaining academies are not up to the standard. We can remedy this by indoctrinating our people with the spirit of higher education. Instead of taking our youth out of school early, parents must be brought to see the advantage of letting them go higher. The colleges will have to depend on our higher schools, and it is the part of wisdom to promote intimate relations and direct connection between them. There should be such a connection between every high school and the nearest college, that those who have the brains could go right up; this is exemplified at Easton, where the whole graduating class at the high school, one year, went from thence to Lafayette College.

Much can be done by inculcating the right spirit among the pupils in the high schools. This is too often neglected. Where it is attended to, the results are marked; for instance, in Lancaster, where the Principal has indoctrinated and inspired his pupils with the desire and love of higher education, seven or eight in a class of eleven have entered college. On the other hand, we want the college men to come down and look at the common school oftener than they do. It is matter of rejoicing to come here and find a college president filling the chair of the State Teachers' Association; but while he and some others are alive to the necessity of mutual sympathy and co-operation in our common work, there are college men who stand upon their dignity, and will not affiliate or fraternize with the common school teacher. So long as this coldness exists, we cannot effect that union which will promote the best interests of all. We want to get together—to unify our whole educational system; then the common schools will be graded up, the colleges will be filled with students, and together we will build up a system broad and deep and high enough to challenge the wonder and admiration of the world.

President Hays said it was a matter of universal regret that a smaller proportion now seek college education. One reason is found in the elevation of the college standard, and consequent lengthening of the time. Twenty-five or thirty years ago, it was quite possible, and schools and academies frequently did prepare boys to enter the Junior class; now, so much has been introduced into the course—sciences then scarcely heard of and other branches—that it is only possible for them to reach the beginning of the Sophomore year. Thus the term is lengthened and the expense increased, so that fewer of the poorer boys can afford it. So we find that fewer students take the full course, and the classes dwindle down in the Junior and Senior years. The standard in the high schools is also grading up, but not proportionately; their mathematics improve more than the classical or scientific course. This might be remedied in the towns at a very moderate cost. For five or six hundred dollars—seven or eight hundred at most—the Board of Education in every country town might put into their highest school a preparatory course. Of course they could not employ a teacher at that salary for that special purpose; but it would not take nearly all of a teacher's time, and it could be made part of his work—then that amount would pay the difference in salary for a competent classical teacher. This could be done in all the towns in this state, and west as far as the Mississippi. The reason of the dying out of the academies was the fact of their location just where the high schools, as they grew up, came into competition with them—namely, in the towns. When they were established, they were needed there; now their place is in the country districts, and those which were located there are the ones that still survive. It is to be remembered that there is no single form of education in this country where the tuition pays for the instruction. Where you combine school and boarding-house, the institution supports itself and makes money out of the boarding.

A well-located boarding-school of a high class can be made a success. We often hear people ask, Does college education pay? They should remember that its benefits are not confined to those who go to college. We may illustrate by that ill-appreciated institution, the Agricultural College: a man goes there and learns to apply science to farming; he returns home, uses his knowledge, and succeeds; and every neighbor that comes along just stops, looks over the fence, and steals his education. The influence of educated men and women upon the country is such that it would pay in dollars and cents to support all these collegiate institutions at the public expense, if only one-twentieth of our youth could take the course. You cannot confine the influence of liberal culture to the single body that is cooped up in one suit of clothes. But, does higher education pay the recipient himself? People point to men who have risen to eminence without college education; but these were men of unusual force or talent; to make the comparison fair, we must decide which of two equal boys would succeed best in the end—the one who did or who did not receive this training. The profession of law gives the best opportunity for comparison. Who are the men that succeed? Nearly all our judges are college graduates. A candid comparison will show that God has ordained that the mind gains power by spending this time in developing itself; and it afterwards does its work so much quicker and better as far to surpass those who began earlier, but missed the training. He not only agreed with the Superintendent that the state should have charge of the academies, but would give it a veto power to prevent their being located too close together. He would put the whole work of education into such intimate connection that the State Department could go into all our institutions, with advisory powers. One state official should be authorized to collect and report information with regard to all branches of the work, and point out the places where help is needed. He believed in supervision throughout. He would not give state aid to the higher institutions until the intermediate schools had been established and were in working order, sending up their students; then, help would be timely and well bestowed. Education should begin at the bottom, and work upward, and the establishment of each higher department will benefit the schools below. He believed that the establishment of a National University—like that at Berlin, with its two hundred professors, each with his specialty—would be the very best thing for every college, high school and common school in the land.

Mr. H. O. Gibbons, Pittsburgh, said that while we are spending so much time and money on our high schools, we should not forget the duty of the community to provide for the class of children who do not attend the schools at all. We should learn a lesson from the Roman Catholic Church, which secures thousands of recruits by going down to these lower strata. While it is all right to be earnest in favor of higher education, he would have us not forget to look below, and make ours really a national system by providing for all.

Prof. Jillson said our elementary schools were good, and also our colleges; but there is a gap between the two. He believed that high schools should be graded up to connect with the colleges. He would hardly go the length of taxing the people to support a college; but the connection could be established by scholarships. The high school of New York has developed into a college; Baltimore has a free college; and St. Louis gives her high school pupils free college scholarships. There is a difficulty in the fact that high schools differ in grade in different places, while in colleges the same class represents about the same grade everywhere. An effort should be made to secure some uniformity in the high schools. Boards of Education should study how to adapt the course of the high school to that of the college. But the community must be educated up to it first; for school officers cannot go far in advance of the people.

The discussion closed here, and on motion, Mr. H. O. Gibbons was appointed in place of Mr. G. Fulton on the Committee on Resolutions.

A motion was made that the report of the committee on place of meeting be adopted.

Mr. G. J. Luckey moved to amend by substituting York for Shippensburg.

Dr. Wickersham moved to amend the amendment by substituting Easton.

Prof. Beard read a telegram from the trustees of the Shippensburg Normal School, assuring the Association of a generous welcome to Shippensburg.

Both the York and Easton amendments were voted down, and the report of the committee was adopted.

Prof. Beard moved that the choice of

of Shippensburg should be made unanimous.

Prof. Brooks thought it would hardly be wisdom to set such a precedent—next year some other Normal School may want to advertise itself in the same way, and the next year another, and so on.

The question was put a second time, and the vote was not unanimous.

Prof. Verrill read the report of the Committee on Election, the names of officers elected for ensuing year being as follows:

President—Geo. J. Luckey, Pittsburgh.
Vice Presidents—W. N. Aiken, Lawrence and Miss Martha Neville, Blair.
Secretary—T. H. Douglass, Pittsburgh.
Treasurer—John Morrow, Pittsburgh
Ticket Agent—J. Fletcher Sickel, Philadelphia.
Executive Committee—H. S. Jones, Erie; G. P. Beard, Shippensburg; L. H Eaton, Fittsburgh; S. A. Will, Pittsburgh; James L. Harrison, Pittsburgh.
Enrolling Committee—C. H. Brelsford, Philadelphia; J. Q. Stewart, Lawrence; M. L. Knight, Beaver; Dr. A. B. Miller, Waynesburg; J. B. Holland, Philadelphia.

After music by the Allegheny Quartette Club, on motion, the discussion of Prof. Amerman's Paper on the Methods of Teaching Natural Science in the Common Schools, was resumed.

Mr. H. B. Whittington illustrated his method of teaching the elements of science to his pupils. He would begin to teach physics by drawing from them a definition of matter and the difference between it and the imponderable forces; then take up the qualities of matter, and illustrate each by simple experiments. For instance, to demonstrate that no two bodies can occupy the same space at the same time, take two glass vessels of different sizes, one partly filled with water; invert the other and press it down below the surface of the water, which is displaced by the confined air. Illustrate the attraction of gravitation by any simple object. Teach clearly the difference between horizontal, perpendicular, and vertical lines—the last two are often confounded. By the use of the simplest apparatus, the facts of the text-book may be made living realities to the pupil.

Prof. A. A. Breneman said he was a specialist in the direction of chemistry. Whether you can teach little or much, make it practical; do not experiment merely for amusement. You must have an occasional experiment, to show that the facts you teach are proved to demonstration. Use the text-book as a basis, but make oral instruction the main feature. Instruct your pupils in the use of the blow-pipe; all the apparatus you need are a few little tubes and half-a-dozen substances, the whole of which may be carried in the pocket. Simple tests are easily made, and there is no loss. This teaching pays for itself in training the pupil to close observation. The blow-pipe is indispensable in teaching chemistry. A tinner will make you one for 25 cents, and with a little washing soda, borax, phosphorus and salt, you can impart a fair knowledge of analysis and laboratory practice. The analytical chemist is both a craftsman and a professional man.

There being no further discussion, Prof. James G. Clark, by request, sang "My Maryland" and the parody on the same, which he gave us *a la* sandwich—alternate verses of each.

The Association then adjourned until 7½ p. m.

THURSDAY EVENING.

THE President called the Association to order at half-past seven o'clock, and the Allegheny Quartette Club sang "Twenty Years Ago."

Prof. E. H. Cook, of Columbus, Ohio, read a paper on the subject of Moral Instruction: Its Place in Public Instruction.

MORAL INSTRUCTION.

ITS PLACE IN OUR PUBLIC SCHOOLS.

BY E. H. COOK.

Fellow Teachers and Co-laborers in the Work of American Education:—I am here this evening by invitation of your Committee to offer a few thoughts on the subject of moral instruction and its place in our public schools—a subject lying at the very foundation of human culture, human character, and human progress. It is with a feeling of extreme diffidence that I approach a theme of such magnitude, and my only apology is my heartfelt interest in the subject.

By moral instruction I do not wish to be misunderstood. I do not mean sectarian or doctrinal instruction; I do not mean dogmatic religious instruction of any kind; but I do mean that instruction which shall give to every pupil throughout the length and breadth of our whole country an insight into his own nature, with a knowledge of the laws governing that nature and a comprehension of his relations to those about him; that which shall create in him a desire for honesty, truth, and true manliness; which shall point out to his view the essential principles on which society is based *morally*, and which shall instil into every fibre of his structure an unselfish, noble and true devotion to our free and beloved Republic; and last, but not least, let it be such instruction as shall inspire his heart and fire it with a pure love for the Author and Giver of all good and perfect gifts, God Himself;—

think I hear some one say that such is not the province of the public school; such culture as this should be left to result from the combined influences of home and the Sunday-school, but should never be expected at the public-school door.

Allow me to ask and answer a few questions, my friend. By whom are the public schools established and supported? By the people. For what end and object do they establish these schools? The education of their children. Why do they wish to educate their children? Now, it is upon the right interpretation of this question that we, as educators, frequently—yes, too frequently—make our great mistake.

Too many, I fear, think that they are simply to attend to the culture of the intellect, the education of the head—which tends to destroy the true growth of the individual in his threefold nature; physical, intellectual and moral.

What, then, is the real object at which to aim in this education? Horace Mann says "Education is to instruct the whole people in the care of the body, in order to augment the powers of that wonderful machine, and to prevent so much of disease, of suffering and of premature death. The body is the mind's instrument; and the powers of the mind, like the skill of an artisan, may all be baffled through the imperfections of their utensils. The happiness and the usefulness of thousands and tens of thousands of men and women have been destroyed from not knowing a few of the simple laws of health which they might have learned in a few months, nay, which might have been so impressed upon them as habits in childhood that they would never think there was any other way." "Education is to inspire the love of truth as the supremest good, and to clarify the vision of the intellect to discern it." "Education must prepare our citizens to become municipal officers, intelligent jurors, honest witnesses, legislators or competent judges of legislation—in fine, to fill all the manifold relations of life. Education is to show our children, in early life, the broad road of demarcation between the value of those things which can be owned and enjoyed by but one and those which can be owned and enjoyed by all." "Education is to give them that firmness of intellectual movement and that keenness of moral vision; that light of knowledge and that omnipotence of virtue, by which in the hour of trial they will be able to walk with unfaltering step over the deep and yawning abyss below, and reach the opposite shore in safety, honor and happiness."

Says Dr. Mayo, in an address delivered not long since, "We cannot understand the real nature of this problem of moral instruction till we rid our minds of a huge drift of vague idealism concerning the province of the public school. * * * In our American enthusiasm for popular culture we are perpetually forgetting that the aim of our common system of state instruction is neither to develop a scholastic class nor to work up our young friend, Jonathan, Jr., into a seraph. The only ground on which we can take the people's money for public instruction is that the common school is the cornerstone of our national order of republican society. The common school house is not a manufactory of scholars or saints, but of good American citizens. * * * * To make good American citizens of American boys and girls, we have the right to do everything that a wise republican statesmanship may dictate. To make scholars in the university sense, or to develop proselytes to any church, we have no right to appropriate a dollar of the people's money. Scholarship and sanctity alike are to be dealt with in the people's schools just in the degree and to the extent that they minister to a lofty and progressive ideal of American citizenship and true American character."

And I might quote from hundreds who, after spending months, of years rather, in thought and observation on this subject, have formed and advocated similar opinions in regard to the object to be gained by public instruction.

In answer then to the third question, Why do the people wish to educate their children? I would say, That we may make our children truthful, unselfish, just, kind, honest, noble, patriotic, pure and incorruptible; in a word, that we may teach them the relations of their threefold nature, their relation to nature, to man and to God.

But perhaps the doubt may arise in the mind of some one, as to whether these relations will not dawn upon the minds of our youth without any special instruction on the part of the teacher When the time shall arrive when children with pens and paper and books, can learn to write and read understandingly without the aid of the teacher, then we may possibly expect such a spontaneous dawning of the moral faculties. But we do not expect such an event; nor, if we did, should we find it realized.

It is not so much the quantity of education given to the pupil as the quality. The school should not be merely a place in which to acquire learning, where the sciences are taught apart from their application to life; but its chief aim should be to prepare the youthful mind to assume the responsibilities of everyday life; and we believe that the true cultivation of the moral powers furnishes the best foundation for the formation of that character which is requisite to meet and overcome in life's conflicts.

If we glance around us at the present time, we find dishonesty and fraud unearthed and brought to light; we find gigantic swindles exposed by investigations; and we see the men engaged in these depredations representing the American people in her legislative halls, and even wearing the judicial ermine. We see in our youth of the present day a growing tendency to despise the puritanic principles of our forefathers, an increasing tendency for simply looking out for "No. 1," regardless of their fellow men, a growing desire for self-indulgence, and the gratifying of the lower appetites:—in fact, a lack of those real characteristics which foretell the true and noble manhood for which in these times of ours we so much long.

We see around us every day indications of rottenness in our social system. Society countenances vices in the American boy and condemns those but half as vile in the American girl. Society does not base her judgments on principle and justice, but rather on policy and egotism. How can these tendencies in our youth be checked? How can the stream of corruption be dried up from the face of our grand old Republican America? Only new, truer, nobler men can furnish a purer state of affairs; and these men must be the outgrowth of a new and better system of education, which shall train our youth to walk in the ways of virtue and peace.

Acknowledging then that there is, in view of the foregoing facts, an urgent necessity, yea, even a demand for this better moral education, we come to another point, viz.: The right of the State to furnish this moral or religious instruction.

Our American system of government is founded on

moral law, and on that found in the Gospels of the New Testament. It needs no special recognition of God in our Constitution, when every principle laid down in our national and state constitutions is based on those given us by the great Lawgiver himself. I fail to sympathize with those who are pleading for a recognition of God in our national constitution. You might as well strive to have him recognized in nature, when everything of his creation is already teeming with His glory and pointing to him continually as the Father of all.

I fail again to sympathize with those who are striving to obtain legislation upon the subject of the Bible in our common schools. It is acknowledged by all Christian nations to be the great book of morals, and whether voted in or out of the schools, the true soul-loving teacher will never let pass an opportunity to impress its great moral truths and lessons upon the hearts and minds of the little immortals placed under his fatherly watch and care.

We need no legislation on this subject. Let it alone; but see to it that you have teachers that will educate your children for true men and women.

The state, it is acknowledged, has the right to make laws for the punishment and the prevention of crime. Upon this one principle alone, the people would have the right to demand that their children should receive that kind of education that should elevate them above the tendencies of vice and crime. If the state have the right to make laws to restrain its citizens from infringing on the rights of others, certainly it has the same right to educate its youthful citizens up to the same stand-point. If the state have the right to punish the dishonest and fraudulent, certainly it has the right, nay more, it is its duty to educate its people up to that stand-point of goodness that they shall be able to escape the penalties of the law.

If the state can legislate against theft, it has the right to so train up its members of society that they may be restrained by moral force rather than by prison bars. If the state can make and execute laws against the committing of murder, assuredly it has the right to educate its subjects to respect the lives of their fellow-men. If, then, the state has the right to make and execute the laws which it claims, then, equally, it has the right, and it becomes its duty, to provide that kind of education which will in the greatest degree, prevent the committing of the vices and crimes prevalent at the present day. Now, admitting the necessity of this moral education, and again the right or rather the duty of the state to furnish this education, we come to the most important part of our theme, and that part which perhaps will allow the greatest latitude of opinion, viz.: How shall we impart moral instruction, and what is its place in the public school? In answering this highly important question, I do not intend to present any hobby-ridden methods, but briefly to point out several ways by which the teacher may assist in reaching the desired result, and I would not forget that we have thousands of noble, true-hearted parents who are eagerly desiring, and aiding in this moral instruction, by home training and by instilling into the minds of their loved ones the necessity for something outside of and of more real value than that instruction to be obtained simply from books; neither, on the other hand, would I pass by the fact that there are thousands, yea, tens of thousands, who never give the subject of their children's education, and especially the moral part, a moment's thought. Hence the great part of this work of training up symmetrical men and women must of necessity, fall to the lot of the common school teacher. We may strive to shrink from the task, but it does not relieve us of this God-given responsibility.

What, then, are some of the ways by which we may, in a measure, satisfy our consciences and accomplish the result?

First, I say, by example. We are not able to measure our influence, neither can we judge of its effects at once upon those around us. We are so constituted that we possess a double influence, conscious and unconscious; but for both we are responsible. None would doubt in regard to the first, the conscious, I presume; but why should any hesitate to answer the responsibility of the last? The unconscious is but the outgrowth of the conscious, and if this is pure and holy, then the other must partake of the same nature. We may be hypocritical in regard to the conscious, but we shall surely betray ourselves in the unconscious.

These influences are more marked in school life than in any other, because teachers are continually brought into contact with younger minds, and just at that time in life, when they are in the plastic state and can be easily moulded. Every act and even every look will make its impression upon childhood, and will stamp itself more or less upon the character of the pupil. I often feel in school work that each child represents, as it were, a camera upon which a photograph of all our acts is so indelibly fixed that it will carry its impression forever.

We must see to it that we show forth, by example, the virtues we would desire to teach others. Perhaps we do not often think how intently all of our pupils are watching every movement of ours, every expression of the countenance, every look of the eye and every outward demonstration of the inward workings of our minds and hearts.

To illustrate the effect of influential moral instruction, I wish to ask you to contemplate two pictures, which I would that I could paint in such living characters that you might wear them in your memories forever. They are pictures of the same school-room, under different instruction at different times, as I myself witnessed it. The first visit was during the administration of a teacher who felt, in a great measure, the moral responsibility resting upon him. Kind and gentle in manner, gentlemanly and dignified in his bearing, sympathizing and affectionate in disposition, yet firm and unyielding when a question of principle was at stake, he seemed constantly to shed around him an influence softened and tempered by a spirit of love for those who were receiving their instruction from him Every pupil seemed to have caught the the spirit trom the teacher, and each seemed to feel his responsibility in the true work of school-life. The acts of each one, the expression of their countenances, in fact the whole manner and tone of the school, seemed to have assimilated itself to the desires of the teacher; a strong moral atmosphere pervaded every portion of the school-room.

Three years afterwards I again visited the same school. At its head I found a man who, in many respects, seemed to possess fair qualities of mind, but not of spirit. The whole scene had changed. There were unkindness and roughness in manner, a lack of gentlemanly bearing and dignity. The whole spirit of the school seemed to be regulated by subtleness and deception. Every opportunity was seized by the pupils to disregard the desires of the teacher, and a recipro-

cal spirit manifested on his part to use all the power vested in him to the discomfort of the pupils. One could but feel that almost a vacuum of moral virtue existed within, judging from their outward appearance. What caused the great and apparent difference? Had the Bible been banished from the school? Certainly not! Had there been a change in text books on moral instruction? Ah, yes; but that text-book was the teacher himself. He was the moral regulator. It was and must be from his example that the genial rays must proceed which should warm and soften the hearts of the dear youth entrusted to his care.

We, as teachers, play upon the heart-strings of our pupils, even as the musician upon the organ; and if he must be master of the keys, if he must know its compass, if he must understand all its stops in order to produce the purest harmony, how much more essential it is that we, as players upon these divinely constructed instruments, should understand the whole nature of their mechanism, that we may avoid all discords and produce nothing but perfect harmony.

That we may accomplish this, our souls must be in sympathy with the souls of the children. Example, then, I would place at the head of the list, in methods of moral instruction, believing, as I do sincerely and truly, in the old Latin motto, *Verba docent, exempla trahunt*, "Words teach, examples draw." Next in importance, I would place instruction by word of mouth; always endeavoring so to lead the pupils that they would not accept it simply as the truth in *word*, but that they might receive it into their very hearts and apply it to their very lives. I would not strive, as some advocate, to teach the pupil honesty, because it is policy to be honest; to be virtuous, since it will pay in the eyes of the world; to be just for the sake of justice. But, remembering that the common school is the product of Christianity, I would go farther, and lead the pupils to be honest, virtuous, just and upright, because it is in accordance with God's aws.

I am not in sympathy with those who would exclude the teaching of our accountability to God from our public schools. We might just as soon expect to raise a crop of wheat from seed sown and germinated in the cellar without the light and heat of God's sunlight, as undertake to produce a crop of unselfish, noble, pure men and women in a school-room with the sunlight of moral responsibility to God shut out. Both would alike be failures. If we would remain in harmony with the genius of our government, we must not stop short of teaching the great truth, "Thou shalt love the Lord thy God with all thy heart, and thy neighbor as thyself."

But when should this moral instruction be given, and how? Shall we have a regular time in our programme set apart for that purpose, and shall we have regular lessons assigned from some of the many books now extant upon the subject? To both questions, from my stand-point, I answer, No. Let us not knowingly fall into the mistakes that have been made in Germany and other countries on this question, where lessons, occupying nearly one-third of the time upon theological subjects, are taught, but the real truths contained in these lessons are almost or entirely overlooked. It is true, practical, vital morality that we desire to infuse into our American boys and girls, and we wish to teach them that morality is above sectarianism, even as patriotism is above partisanship.

Time, of course, must be taken in order to accomplish this great work. It is true that every well-regulated and well-disciplined school is constantly imparting moral instruction; and let me remark just here, that in every case of discipline, an endeavor should be made to associate in the mind of the offender the punishment with the evil to be overcome, and not with the good expected to result from the chastisement; otherwise the good which might have resulted is rendered odious to the pupil by associating it with his guilt and his punishment, from both of which he shrinks.

But we must not stop here. Moral instruction must permeate every lesson and exercise of the school, and a teacher should never miss an opportunity to impress a moral truth, and as Raphael was accustomed to see and feel, that there was an imprisoned angel in the blocks of marble which he was cutting, and would, therefore, chisel away with renewed energy that he might set the prisoner free, so the teacher should see in every pupil an immortal soul struggling to free itself from the shackles of vice and immorality which would bind it down forever.

As the old philosopher felt in the enjoyment of his little garden, that though small in its dimensions, yet it had a wondrous height; so should the teacher feel in regard to the immortal beings under his control; that though hedged in by this body, yet in moral capacity there is a wondrous height, up to which it is his privilege and duty to lead this trusting childhood. Let us, as educators, remember these beautiful lines, familiar to us all:

Thou must be true thyself,
If thou the truth wouldst teach;
Thy soul must overflow, if thou
Another soul wouldst reach.
It needs the overflow of heart
To give the lips full speech.
Think truly, and thy thoughts
Shall the world's famine feed;
Speak truly, and each word of thine
Shall be a fruitful seed;
Live truly, and thy life shall be
A great and noble creed.

Prof. J. W. Shoemaker, by request, read from Mark Twain's "Roughing It," the account of "Buck Fanshaw's Funeral."

The Executive Committee reported that they had met and elected Prof. James L. Harrison, of Pittsburgh, to be their Chairman.

Prof. A. A. Breneman then delivered a lecture on Sound, illustrated by experiments.

SOUND AS A FORCE.

BY A. A. BRENEMAN.

If there is one comprehensive idea, one grand generalization which will serve to mark the progress of scientific thought during the present century, it is that which refers all physical phenomena to the action of correlated and interchangeable forces. The study of physical science to-day is a study of *force*. Phenomena translate themselves most readily when questioned as to their relations with the measurable element of mechanical force. If we were asked to define this term

force what should we say? It is a *something* acting through matter and known only in its effects upon matter. Matter is the roadway, so to speak, upon which this *express train* of force is made to travel. An eminent man of science has said, in effect, that were the space between sun and earth a perfect vacuum we should know of the light and heat of the former only by actual contact with his surface.

It is to the action of force in the case of sound that I would call your attention this evening, and I have chosen this subject because the effects of sound are produced in a more tangible way and commonly in a medium more readily examined than that in which such agents as light and heat are believed to act.

Force applied to matter is carried through it, not instantaneously, but by a kind of gradual progression, like the motion of a wave, in which each particle is for an instant the vehicle of the impulse before it, and passes it on to a particle adjacent. Were I to resort again to the railroad for a figure, I should say that force is like a traveler incessantly changing cars.

When I spoke a moment ago of the wave-like motion of force, your minds no doubt suggested the material in which we most commonly see waves, and in seeking to explain wave-motion I cannot do better than to take *water* as the starting point.

I need not describe to you the familiar yet beautiful appearance of water agitated by a blow, as when a pebble is thrown upon a smooth surface of it. Those widely-spreading circles moving out from the centre of disturbance, each one larger and fainter than its successor, are the measures of the force with which the water was struck, and could you receive the entire force of these waves at a single blow, would closely represent it. I have recently seen an article which suggests in a striking manner the force inherent in waves of water. An engineer familiar with the physics of the Lower Mississippi has come to the conclusion that to the trade of the Northern States, whose boats navigate that river, is chargeable the wear and tear of the levees which the people of the Lower Mississippi maintain for the restriction of the river within its boundaries. He estimates the aggregate blow annually delivered upon these banks by the comparatively small waves which steamboats produce, as equivalent to millions of tons. Many instances might be given of the powerful effects of small water waves. It must be plain to you that the disturbance which is seen upon the surface of the water is also carried on to a certain extent beneath that surface, and that if the agitation could first be produced *under* water, a disturbance like that produced when the pebble was thrown, would be carried upwards, downwards, and in all directions at the same rate. A series of waves would thus be produced which we may compare to a number of hollow balls, one enclosed within the other. Grasp this idea, and you will have in your mind's eye a picture of the condition of the air just after the production of a sound. It is when our ears intercept portions of the surfaces of these advancing waves that the delicate system which constitutes our auditory apparatus is set into vibration, and we have the sensation of sound. But it is evident that for each individual a definite portion of the whole wave only is concerned in transmitting the sound. A chain of air-particles, so to speak, is the line connecting his ear with the source of sound. I propose, therefore, to study the sound-wave in air by breaking it up, in imagination, into all of the chains of air particles radiating from the source of sound, and taking one of these as the representative of all. Let us first inquire how the force is repeated from one particle to another along this chain of air. Imagine upon the table before me a row of billiard balls. A blow struck at one extremity of the line would be repeated throughout its whole extent until the final ball, being unsupported at its farther side, would be thrown off. The time elapsing between the blow and the rebound of the last ball would depend upon the quickness with which each ball, when struck, handed over the blow to its neighbor. Now this power of re-acting against any force which tends to push apart or draw together the particles of a body is called *elasticity*. All bodies are more or less elastic, but the elasticity of some is far greater than that of others. Let us begin with a very simple experiment. I have here a common ball of the highly elastic substance, india-rubber. Throwing it upon the floor with some force it immediately returns to my hand. The blow received from the floor for an instant squeezed the particles of india-rubber together, but it was followed by the re-acting *kick* with which these particles protested, so to speak, against the enforced crowding. In this way the floor was pushed away, relatively speaking, with the force that a moment previous had been applied to pushing *it* against the ball.

Again, taking a bar of lead, which is suspended by a string, I strike it smartly with this piece of iron. The sound is dull and heavy. The lead is pitted by the stroke and refuses to regain its shape. Bending the bar, it remains bent. Lead, therefore, is but slightly elastic. Compare the behavior of this bar of steel, similarly treated. A slight tap elicits this clear ringing note which resounds long after the blow. The particles of this highly elastic substance once thrown out of place continue to move backward and forward, under the impulse first given, and the surrounding air, receiving a series of blows from the vibrating steel, is thrown into a series of waves which are now breaking against your ears. There are, indeed, several sets of waves produced in this case, but, as in water, all pass through the air side by side at the same rate, and without affecting the motion of each other. The steel bar when bent will return to its original shape. Sounding this tuning fork of steel, by drawing across its prongs a violin bow, we obtain a clear, ringing note. I have known of a case in which a steel bar bent into a triangle was made to do duty as a bell, and, from what you have heard, you will readily believe that it was effective. It has recently been proposed to substitute bars of steel for the costly chimes of bells used in many cities.

Common air, though much less elastic than many other substances, is yet sufficiently so for the transmission of these impulses which give to our ears the sensation of sound. Warm air is more elastic than cold, and hence conveys sound more rapidly. So much for elasticity.

Returning now to the consideration of the air-wave, I will ask you to observe this long cord of india-rubber. It has a length of twenty-four feet, which, by tension, we increase to thirty. Imagine this to be such a chain of air particles as we considered a moment ago, to be the special part of the air wave which each individual employs in hearing. Consider my hand as the source of sound, and the fixed end, high up the wall, as the entrance to the ear. I draw the cord upwards for a moment with the fingers of the disengaged hand, and then suddenly release it. A short curve is formed and runs

quickly along the cord to the farther end. Stretching the cord and repeating the experiment, we find the curve to pass along more rapidly because the elasticity of the cord is increased, and each particle of the cord re-acts more promptly upon its neighbor. These impulses would be perceptible as shocks to a hand holding the farther extremity of the cord. You will observe that the curve on reaching the farther end is reflected and returns along the cord, but always *inverted;* that is, a curve which is on the upper side of the cord *going out*, is underneath in *returning*, and *vice versa*. This fact will soon be of service in our study. Allowing the cord to swing slowly up and down, I catch its motion and time my hand so that a new impulse is given at each successive swing. The middle point is now moving up and down through a space of twelve feet, while all parts towards the ends are moving through lesser and lesser distances. Let us agree, for future purposes, to call this mode of motion the *fundamental* motion of the cord. Again, I throw a curve upon the cord at such a time that it shall reach the middle and tend to draw it upward while its fundamental swing is moving it downward. What is the effect? The cord is simultaneously acted upon by two forces tending to carry it in opposite directions. It is forced to come abruptly to a stop and remain still, but the two halves of the cord go on swinging just as the whole cord did before. But observe; they swing alternately, one up, the other down. The impulses still run along the cord, but they cross or meet each other at the centre, which is therefore a point of no motion. Such a point is commonly called a *node*. The halves of the cord are now moving at twice the rate of the fundamental motion. Giving to the cord a succession of rapid impulses, I break it up on the same principle into three, four, five and six moving portions all separated by fixed points or nodes, but similar to the fundamental form. Of course all adjacent parts swing in opposite directions. This mode of dividing the cord into vibrating parts by a series of rapid impulses, is closely analogous to the manner in which a chain of air-particles may be broken up. But you have remarked, perhaps, that after imparting to the cord a motion such that it was broken up into a given number of parts separated by nodes, I held my hand still, and allowed the cord to continue that motion by means of its elasticity. An attempt to continue the impulses at the same rate would have caused the breaking up of the given series and the formation of a new one, because my hand is incapable of hitting with accuracy the times of the vibrating parts. If, however, we can obtain an instrument capable of swinging a cord at exactly equal intervals, the motion may be continued for a much longer time. Such an instrument we have in this large tuning-fork, which, unlike the one previously shown, produces but feeble sound. Its mechanical force is much greater however, and in that respect it is better suited to our present purpose. When set into vibration by the bow its prongs move to and fro with the regularity of a pendulum. Attaching one end of this stout silk cord to a hook with which the prong is provided, and the other end to a support placed about nine feet distant, you will perceive, when the bow is drawn over the fork, that a series of swelling is produced upon the silk cord. These are separated by nodes and in all respects similar to those produced on the large cord. The prong of the fork, in its to-and-fro motion, gives to the cord a rapid succession of jerks, starting a series of curves which, if the cord be long enough, as it is, will be intercepted by others before they return and nodes will be formed. I cannot readily produce with *this* fork more than one rate of motion, and as we cannot send the curves in more rapid *succession*, it is impossible to imitate the hand in increasing the number of vibrating parts. But you will remember that the elasticity of the cord may be increased by stretching it. In this way then we compel the impulses to travel more rapidly, the curves move farther before others follow, and, in consequence, the vibrating parts into which the cord is divided are fewer and longer. In this way we obtain sucessively six, five, four, three, and two divisions of the cord, and finally, under extreme tension, we find the impulse to make the entire circuit of the cord before another is started, and the cord swings at its fundamental rate.

The two cords which we have examined, in many points resemble our ideal chain of air-particles, but I cannot leave this portion of the subject without calling your attention to an instrument which is a truer representative than either of that ideal. It is a spring of brass wire which we extend by stretching to a length of eighteen feet. Its great elasticity is shown by its quivering motion when the slightest impulse is imparted to it. It is now held fast at each end. Catching one of the rings of the spiral I draw it back and then suddenly release it. It rebounds, striking its neighboring ring, which in turn transmits the force to another, and in that way the impulse runs along the spiral to its farther end, where it is reflected and returns in the same way. Repeating the experiment, I will ask the gentleman who holds the farther end to mark, by a motion of his hand, the moment at which he feels the shock. In this way you are enabled to determine the rate at which the impulses run along the spring. Now, it is evident that during this passage of the impulse the rings of the spiral are alternately crowded together and drawn apart, or, as we may say, they undergo *condensation* and *rarefaction* in turn. In a precisely similar manner does a chain of air-particles behave when excited by an impulse. Its particles are alternately condensed and rarefied along the chain and in the direction of the moving force. I say, then, that the spring is a more perfect representative of an air-chain than are the cords, because the particles of the one move back and forward in the line of the force like the air-particles, while those of the other move *across* that line. Each particle moves but a short distance to and fro, while the impulse travels the entire length of the spring. It is possible also to obtain a series of nodes in the spring, but from the nature of its motion the moving parts would be imperceptible to you.

Having now come into possession of numerous analogies bearing upon the question of vibration of the air, let us carry our experiments directly to the testing of the air itself. When I sound this tuning fork it is plain that its prongs are striking a succession of blows upon the air, and that a series of waves should be started along the chain of air-particles which reaches out into space in the line of the prong. The forward motion of the prong crowds the particles together and causes a condensation, the backward motion permits the rebound of particles adjacent to the prong and causes rarefaction, while both condensation and rarefaction pass out in succession along the line of air-particles. The length of the air-wave which consists of a condensation and a rarefaction, will depend upon the speed with which the impulse moves through the air, or upon the dis-

tance which one impulse is enabled to move before another is started after it. In the air of this room, supposing its temperature to be 60° Fahrenheit, these impulses move at the rate of 1120 feet per second. The fork before you, when its lowest note, or fundamental, is sounded, strikes the air at the rate of about 190 blows, *in the same direction* per second; hence the impulse will pass $\frac{1120}{190}$ or about six feet from the prong before it is followed by another of like kind, and six feet is therefore the length of the air-wave corresponding to the sound of this fork. It is a proper time now for you to know that our ears are incapable of appreciating as sound, impulses that reach them at a lesser rate than sixteen per second, or at a greater rate than twenty-four thousand per second. Within these limits all sounds, whose impulses or vibrations are separated by equal intervals of time, yield true *musical notes*. If the intervals are of unequal length the sensation is unpleasant and is distinguished by the term *noise*. Whether the note be high or low depends upon the number of vibrations per second. The note of lower pitch has fewer vibrations and necessarily represents a greater wave length. Waves of all sizes, *i. e.*, notes of all degrees of pitch, pass through the air at the same rate and pass through and among each other without losing their identity. Were it otherwise, what dire confusion must be produced by the music of an orchestra, where the note of a violin would come lagging behind the tones of the double bass meant for its accompaniment?

I have here a square tube of wood, three feet in length, open at both ends It is in fact the tube of a church organ. I am using it at present, however, only to enclose a given portion of air, to cut out, as it were, a rod or bar from the surrounding air, upon which we may experiment. Removing the fork from its case and striking its prong upon the table, it is set in vibration, but the sound is too feeble for you to hear. Bringing it opposite this opening in the end of the tube, however, the sound swells out into a roar of considerable power.

A moment's consideration will explain this result. The condensation of air produced at the mouth of the tube passed through the enclosed air to the farther end, where, meeting free air, its pressure was relieved. This sudden relief of pressure by means of the elasticity of the air, causes a rarefaction, which runs back through the tube to the starting point. Now, the tube is of such a length that this entire journey is performed in just the time intervening between two outward movements of the prong of this fork. In consequence, the faint sound returned to the fork is added to a similar one just produced, and by continually augmenting the faint sounds, we obtain in time the loud note which you have heard. A tube then gives us a mode by which any slight sound may be greatly increased. Observe that the length of the open tube is in all cases *half* the length of the air-wave to which its note corresponds. The three-foot tube resounds to a fork which we have found to produce a six-foot wave. The organ tube is furnished with a mouth-piece through which, by reason of its peculiar construction, a sheet of air may be directed against this wooden edge, opposite the slit from which the air issues. A flutter of air is thus produced from which the tube selects a rate of vibration to which it can respond, and, upon the principle just explained, augments this sound to the exclusion of all others. Blowing into the mouth-piece we obtain a note which by comparison is found to be identical with that of the fork. In this case we have sounded what may be called the fundamental note of the tube, *i. e.*, its lowest possible note as an open tube. The column of air within is composed of two quarter-waves with a node at the centre, the entire circuit of the tube being, as already mentioned, necessary to the production of a whole wave. In open tubes the extremities, being in communication with free air, can never be nodal points but are invariably points of greatest motion. Other modes of division may be obtained. By a more forcible blast of air we obtain from the tube a note which is the octave of the last, that is, produced by twice as many vibrations per second. The confined air in this case is broken up into a greater number of parts, as in the case of the cord. There are now two nodes within the tube, one-fourth its length from either end, while the middle and extreme points are in most rapid motion. In the case of the deepest tone or fundamental note of the tube we had a node at the centre only. Now this node may be regarded as a rigid wall within the tube, against which the aerial waves abut, and from which they are reflected. In proof of this we place at the middle of the tube, within, a block of wood entirely filling the passage. The same note is obtained whether the tube is sounded by blowing or by the fork. It is of the pitch of the fundamental note. The height of the air-column within the tube is only 18 inches in this case, but *it is closed at one end*. Bringing the prong of our vibrating fork to the mouth of this tin jar, also eighteen inches in height, its sound is increased in a similar manner. Withdrawing the stop of the organ tube to a point beyond the middle, and increasing the height of the jar by means of this sliding collar, we find in each case that the fork is incapable of eliciting a note. Eighteen inches, then, is the only possible length for a closed tube which shall respond to this definite note of this fork. But the wave-length of the fork is six feet or seventy two inches. A closed tube then resounds to a note whose wave-length is *four times* that of the tube. The note produced by exciting the air within a *closed* tube, then, is one octave lower, *i. e.*, it represents only half as many vibrations per second as the note of an open tube of the same length. Let us test this law. Placing the wooden stop just within the mouth of the tube, and sounding the tube, we obtain this deep bass note. Removing the stop we sound it again, and obtain the fundamental tone of the open tube which a musical ear will readily distinguish as one octave higher than the preceding. The fundamental note of the closed tube represents a twelve-foot air-wave, that of the open tube a six-foot wave. To determine the wave-length of any note, therefore, we have simply to find the closed tube which resounds to it, and to quadruple the length of this tube. Nothing that I have said, however, is meant to conflict with the fact that in the closed tube also we may have subdivisions of the air-column, and thereby obtain higher notes bearing simple relations to the fundamental.

Let us apply the laws just derived to substances other than air. I have here a rod of glass, five feet in length. Holding it by its middle we ensure the formation of a node at that point when the rod is made to vibrate. A piece of moistened flannel is drawn along the rod, and by a series of impulses, in which the rod is alternately grasped and released in rapid succession, it is set into vibration in the direction of its length. Waves of condensation and rare-

faction are now traversing the rod from end to end, the extremities being in rapid motion while the middle is at rest. The motions of the glass are transferred to the air, and you catch this high shrieking sound, which is the fundamental note of the rod. Now, as the impulses travel along the glass at a rate seventeen times as great as in air, it is evident that the note here obtained is of the same pitch as the note of a column of air *less than four inches in length*. In other words, the note of an air-column five feet in length corresponds to that of a glass rod, of equal thickness, and eighty-five feet long. It would be a matter of some difficulty to construct a musical instrument of glass where tones of low pitch were desired. The same effects are produced when tubes of glass are rubbed. This fine six-foot tube yields a clear ringing note superior in beauty to any sound that I can produce. Simultaneously rubbing these tubes of different thicknesses we obtain a chord which musicians would call a *third*. I need not enter, at this time, into the explanation of the higher tones possible in the case of tubes. The rules derived in the case of the air-column are equally applicable here. It is evident that we have now obtained a means of estimating the rate at which impulses travel in any medium from the known velocity in air. Simply ascertain the lengths of columns of air and the given materials respectively producing notes of equal pitch. These lengths are to each other as the rates of transmission.

You will remember that the node, or point of no motion in a vibrating body, is, of necessity, the point where particles are submitted to the greater strain, and were the vibrating substance to break under its own violent motion, it must break at this point. Holding this large tube at its middle point, I move the pad rapidly up and down along the tube, avoiding pressure. The note swells out loudly, indicating great agitation of the particles, and finally the tube falls apart at its middle point. Were you to examine these fragments you would find that they have the form of rings, corresponding to the layers of glass which transmitted the vibrations, while the rings themselves are marked by fine circular cracks which indicate that the subdivision is carried to microscopic fineness. This effect is to be regarded as the accumulated result of slight impulses, since the force applied to the tube was in no case sufficient to produce instant rupture.

*In conclusion, I would call your attention to some experiments of an order entirely different from the preceding, but especially calculated to exhibit the *force effects* of sound. The finely-pointed tube before you is attached, through this stand and tube, to a reservoir of gas. Opening the stop-cock, and lighting the jet, I reduce its height to half an inch, and enclose the flame in this wide tube of glass, as an Argand oil flame is enclosed in its chimney. At certain positions within the tube the flame acquires a peculiar club shape and slowly swells into this monotonous song. The note, as you will imagine, has a close relation to the length of the enclosing tube. It is in reality the fundamental note of this tube, the same note which I can produce, though quite too indistinct for your ears, by blowing across the end of the tube. The draught of hot air up the tube produces a fluttering motion of the flame, from which flutter the tube selects, as in the case of the organ tube, a tone corresponding to its own, and by repeated reflections of one wave after traveling the tube upon another just about to start on the same journey, intensifies this one note to the exclusion of all others. The little flame is now bobbing up and down within the tube at a rate corresponding to the upward and downward rush of the impulses. It is actually being *blown out* and *relighted* by the hot air about five hundred times a second. Reducing the size of the flame, it is possible to obtain a note which is an octave higher than this. Replacing the tube by longer or shorter ones, we have in turn lower or higher notes. For a tube of given length, however, the flame can sound only a given note, or some higher tone whose rate of vibration bears to that of the first the relation of 2, 3, 4, &c., to 1. Placing a larger tube like a collar over the first, we obtain, as the length of the tube is altered by the sliding of the collar, a wailing tone, rising or falling as the tube is shortened or lengthened. A more curious effect awaits us. Placing this small flame at a point within this short tube such that it refuses to sing, I call to it in a tone which I have previously found to be the tone of the tube. The flame responds with the same note and continues to sing after my voice has ceased. Quenching the song by closing the end of the tube I repeat the note from a greater distance, and again the flame responds.

Starting several notes below this, I run up the scale, stopping long enough between the notes for you to satisfy yourselves that the flame remains silent. At the instant when the proper note is reached, however, the flame bursts into song. From any combination of notes it would pick out this one with unerring accuracy. What is the explanation? The sound of my voice produced a series of air-waves to which the air within the tube could respond. The flame was started into vibration at the same rate, it re-acted upon the air within the tube which in turn re-inforced its sounds as before explained. At a different point within the tube the flame is capable of starting itself into song. I place it now at a point such that it requires a whole minute to accumulate a sound audible to you, but, during most of that time, I hear it slowly building itself up, so to speak, by accumulation of its own slight impulses.

Again, I have here a naked flame which rises from this burner to a height of nearly two feet, and yet is less in thickness than a finger. The long tongue of flame issues under great pressure. It is in fact at such a point, that, if the pressure be increased in the slightest degree, it will roar, and, changing shape, will sink to a much lesser height. An ordinary gas-burner often behaves in a similar way when the stop cock is widely opened. The roaring is produced by vibration of gas within the orifice of the burner, when, by reason of extreme pressure, it is *crowded*, so to speak, at that point. Permit me to use a homely illustration: A flock of sheep, driven rapidly through a narrow gate, often become so closely wedged in that a few are forced to retire before those remaining can pass the gate. The retiring sheep being in the front rank, rush at the next instant, with the others, towards the gate, they are wedged again, but, as the rear members of the mass retire to relieve the pressure, those which had previously retired are now ready to pass through. Suppose this spasmodic action to be uniform in period, the whole mass of sheep will be alternately urged forward and thrown back, a few passing the gate at each impulse. If you have

*It is proper to mention that the lecture is here given as originally prepared. Owing to the lateness of the hour it was deemed advisable to omit the flame experiments and their discussion.

grasped the illustration you will readily apply it to the case of gaseous particles under pressure forcing their way through the narrow orifice of the burner. When the orifice is just large enough to avoid this condition of excessive crowding the gas-flame burns smoothly, but a very slight impulse from without will suffice to throw the gas into this condition of vibrations. With the flame before you I find that high notes only can produce this effect. It is especially sensitive to this chirping sound of the lips. You see it shortening when I produce that sound at a distance of 20 feet from the flame. At the suggestion of a kissing sound it is intensely shocked. A hiss affects it strongly. I recite the words "So slowly sinks the setting sun;" at each recurrence of the sibilant it sinks. I strike together these rods of glass; at every touch the flame shortens. I shake this little bunch of keys; at a distance of many feet the flame still quivers in sympathy. The crumpling of a sheet of paper produces violent agitation. The vowel sounds, A and I, affect it more strongly than those of E, O, and U. I have been much annoyed, at times, when experimenting with these flames, to find them leaping at improper times to the sound of a distant blacksmith's anvil. Remember that these slight sounds produce waves of air which are the true means of communicating the impulses to the distant flame. No experiment that I could make would more strikingly illustrate the fact, at which I have especially aimed in the lecture, namely, that all sound-waves, however small, are true vehicles of mechanical force.

It would seem, then, that the force of sound, like matter, is indestructible. It has long been said that the *loss* of a grain of sand would destroy the balance of the universe. May we not say with equal truth, that the *loss* of the faintest sound wave would produce a like catastrophe? Each sound whether loud or faint, each impulse of the atmosphere, finds somewhere a responsive thrill, whether it be the thunders that shake the mountain peaks or those softer impulses which are led through vibrating membranes, over long bridges, and through tortuous passages, to produce at last that motion, or change in brain matter, which under the name of music charms the senses of a Mozart.

I have chosen to treat the subject in this experimental and reasoning way because it has seemed to me that you, as teachers, would more readily appreciate a mode in which the listener is made his own discoverer. The mode is a more laborious one, perhaps, and less suited to mere entertainment; but it is one which makes the subject studied more truly your own. Our conclusions have been built upon our experiments. And this is the way, after all, in which we must teach, if our students are to become thinking men; if they are to become questioners and observers in the world; if, in fine, they are ever to arrive at that condition of skepticism in regard to unsupported assertion, which, in matters of science, is the stepping-stone to knowledge.

On motion of Supt. Luckey, the following resolution was adopted unanimously:

Resolved, That our chairman, Dr. Geo. P. Hays, is entitled to, and is hereby tendered, the thanks of the members of this Association, for the able, courteous and gentlemanly manner in which he has presided over the deliberations of this body.

The committee appointed to audit the Treasurer's account, made the following report:

PITTSBURGH, Aug. 14, 1873.

The committee appointed to audit the account of Mr. D. S. Burns, late Treasurer of the Association, beg leave respecfully to report as follows:

Balance in Treasury August 22, 1872.....	$ 303	45
Enrollment fees rec'd in 1872.....	1,102	05
	$1,405	50
Expenses of Association to Aug. 12, 1873..	730	34
Balance in Treasury.....	$675	16

Signed, GEO. L. MARIS,
C. H. BRELSFORD,
Auditing Committee.

The Committee on Resolutions then reported through their chairman, Mr. H. O. Gibbons, as follows:

Resolved, That a vote of thanks be tendered to the teachers of Pittsburgh and Allegheny, for the comfortable and elegant hall provided for our meeting; also for the pleasant and very enjoyable boat excursion down the Ohio.

Resolved, That we most heartily recommend the co-operation existing between our public school teachers and the professors of the classical institutions of the state; and that we will lend our aid and assistance to the establishment of such schools as will connect the public schools with the college.

Resolved, That a more extensive course of study, and a more thorough school discipline, is most desirable for all who are training for teachers; and that a higher mental and moral culture on the part of our school instructors would be the certain means of elevating all our institutions of learning and rendering them more acceptable to the public.

Resolved, That it is most desirable that all our teachers be required to pass examinations in, and required to teach music and drawing, and that a committee of three be appointed to make a report on these subjects at next stated meeting.

Resolved, That the attention of our school authorities be called to the condition of boot-blacks and news-boys, as well as the thousands of children not receiving the benefits of our public schools.

Resolved, That a vote of thanks be tendered to those members of the Association who prepared and read the able papers presented for discussion, and to those who have furnished the excellent and entertaining music and readings which we enjoyed during the session

Resolved, That the Association wish to bear testimony of their confidence in our State Superintendent, Dr. J. P. Wickersham, and of their high appreciation of his most excellent services.

Resolved, That we hereby thank the newspaper press of Pittsburgh for their faithful and full report of the meetings of the Association.

On motion, the report was adopted.

The Chair then called upon the President elect to make the "usual speech."

Mr. Luckey responded, thanking the Association for the honor conferred in his election. If he succeeded in presiding over the body in half as good style as the present chairman, he should consider himself very

fortunate. While he expected his good-nature to carry him through many difficulties, he could not enliven the proceedings with the ready wit of Dr. Hays. For the teachers of Pittsburgh, he would say that they had tried to make the session pleasant and agreeable to their visitors, and would welcome them at any time, singly or collectively, and take pleasure in showing them the schools, which are not yet what they should be, but this he hoped public spirit would yet make them. Pittsburgh teachers would remember the present and former meetings with pleasure, and endeavor to send larger delegations to the annual gathering in the future than she had done in the past.

Gen. Louis E. Wagner, of the Board of Control of Philadelphia, was called upon and responded briefly. It had been his fortune, or misfortune, to be connected with public affairs in Philadelphia—in Councils and in the Board of Control—and he could therefore appreciate both their advantages and deficiencies. Philadelphia has not been niggardly in school appropriations; we have spent four millions, and will soon add another, for we do nothing by less than a million. We have an army of scholars, a brigade of teachers, and a regiment of directors; but we are deficient in this, that all this great army drifts along without a head. We are not so *lucky* as Pittsburgh; we need a school superintendent, and we will keep pegging away until we get one. When to all our present advantages we add an efficient head, our system will be complete, and all its parts will work together in a harmonious whole; and so he pronounced the benediction upon Philadelphia. [Applause and laughter.]

He very warmly congratulated those who had been privileged to attend all the sessions. Pittsburgh had done herself honor in receiving the Association, and the members would carry away with them pleasant recollections, as well as solid benefits. He hoped the influence of the Association would continue to increase from year to year, to the benefit of its members, and the profit of our educational system, public and private, throughout the state.

Dr. Hays wondered what kind of a speech it would have been if the general had found his trunk.

On motion of Mr. W. R. Ford, a resolution was adopted, returning the thanks of the Association to the managers of Dixmont Hospital, for their kind reception and treatment of the excursionists on Wednesday.

Mrs. A. M. Martin read a selection—"An Idyl of the Period."

Professor Shoemaker was called for, and the audience would take no excuse; so he read "Pat's Excelsior."

Dr. Wickersham was called upon, and after returning thanks to the committee on resolutions and the Association for the expression of their confidence, remarked that one of the newspaper reporters had described him as "on the shady side of life." Perhaps that was correct, though probably meant as a joke; and he would take an old man's privilege, and remind the body of a scrap of history. This Association was formed at Harrisburg in 1852; and the next meeting was held in Pittsburgh. He came out, passing over the mountains on the old inclined planes, with a handful of educational men from the east. The contrast is great between that meeting and the present.

We were just as much in earnest then as you are now, but we were few in numbers, though the meeting was all that could be asked in spirit. He considered the present meeting a success. The unpleasant weather and the rumors of cholera were against it. It is emphatically a meeting of the teachers and friends of education in Western Pennsylvania, and as such it is a magnificent success. Looking back to the beginning of this work, he felt that those who remain of the men of those times are growing old; the young must take their places, assume their burdens and build up a system without an equal in the Union or the world.

President Hays said that the teachers of Western Pennsylvania are alive and in earnest in all that relates to the work of education. He hoped all would return to their homes, ready to use in their schools, and give their pupils the benefit of, what they had learned here. He knew no grander work than this work of instruction. To those who take it up with a proper sense of the responsiblity it involves, it is not mere drudgery, but excites an enthusiasm worthy of those who labor, not for themselves alone but for the future welfare of the country and the world in which we live. And now, after a pleasant and harmonious session, in which there had not been a single unkind word or feeling, we would close as we began, with a song of thanksgiving to our Creator.

The Association sang the long-metre doxology, and after a brief prayer and benediction by Dr. Hays, adjourned to meet at Shippensburg, in August, 1874.

MEMBERS IN ATTENDANCE.

ALLEGHENY—85.
A. T. Douthett,
Matilda Ware,
Mary Cooper,
Lizzie Weaver,
Annie Boswick,
Hattie Davis,
E. Mills.
Keziah Kennedy,
M. A. Duncan,
Mary D. Leckey,
S. A. Neale,
Emma George,
Sue E. Hunter,
Annie E. Hunter,
J. H. Leckey,
J. J. Snodgrass,
Angie Stewart,
M. H. McCabe,
Mary M. Alger,
Eva McEwen,
Sadie J. Kidd,
Mary C. Hayes,
John Morrow,
E. H. Young,
J. M. Conroy,
Harriet A. Graham,
S. Lenker,
A. O. Mitchell,
Mary C. Boder,
S. C Farrar,
M. B. Kingerlee,
Jennie Sterling,
Jennie Adair,
Annie Smith,
M. J. McDonald,
R. McFall
Hattie Dawes,
Emma McIlwain,
G. M. Shiletto,
G. A. Smith,
S. M. Haller,
Annie Nevin,
M. E. Galbraith,
Tillie Jamison,
Mary M. Renwick,
L. H. Renwick,
Lucy Rogers,
Nettie McCormick,
Annie B. Fraser,
Anna Russell,
J. W. Bailey,
Tillie Thompson,
W. T. Morehead,
Annie C. Rogers,
Bella Hunter,
J. B. Wilkinson,
Annie E. Wilcox,
Z. A. Bunn,
Mary E. Walker,
Lannie M. Read,
Sadie J. Wright,
B. Benson,
S. J. Gardner,
O. H Philips,
Sue Johnson,
Bell Johnson,
Anna C. McCall,
T. T. Newlin,
R. M. Cargo,
(Music Teacher.)
Maggie J. McCugh,
Clara Peebles,
Julia Scott,
Anna F. Mays,
Maud Hamilton,
Mary Ross,
Anna McCague,
Maggie Crewsen,
Sadie E. Patton,
Mary McElwain,
Emma B. Means,
Mary M. Brown,
Ella M. Brown,
Jennie M. Orr,
W. A. Maloney,
Mary McChesner.

ARMSTRONG—17.
A. D. Glenn,
J. P. Redick,
Edward Burke,
C. C. Emigh,
Hugh McCandless,
M. A. McCandless,
M. E. McCandless,
Millie Taylor,
Lizzie Gibson,
Mattie Crosby,
Celia Sherman,
Lizzie Kepple,
Anna L. Paul,
Retta McCain,
William T. Slater,
M. L. Thounhurst,
J. H. Dickey,

BEAVER—12.
M. L. Knight,
Sallie Platt,
Mary Platt,
John Knott,
Benj. Franklin,
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THE CHURCH ORGAN.—I would not seem unduly enthusiastic in speaking of this instrument, developed by great providential events until it has reached a place in which manifestly it stands a prime, a divine power in the world. I look upon the history and the development of the organ for Christian uses as a sublime instance of the guiding hand of God's providence. It is the most complex of all instruments—it is the most harmonious of all—it is the grandest of all. Beginning far back—growing as things grow which have great uses—growing little by little, it has come to stand, I think, immeasurably, transcendently, above every other instrument, and not only that, but every combination of instruments.

The organ means majesty; it means grandeur. It means sweetness to be sure, but it is sweetness in power, like the bubbling crests of waves on the ocean. Whatever it has of sweetness, of fineness or of delicacy, it has an under-power that is like the sea itself. And I thank God a thousand times a year, when, seeing how many things taste and the social elements have stolen from religion, I turn around to this one solitary exception and know that religion at any rate has left, as peculiarly its own, the organ, the grandest thing that was ever thought ot or combined in human ingenuity. Running, as it does, through all the grades and elements of sound, just as soft and as sweet as the song-sparrow (which is the sweetest bird that sings) in its simplicity, rising through all gradations, imitating almost everything that is known of sounds on earth, it expresses the thunder and the earthquake, and almost the final trumpet itself! Then we have its grand accompanying power. And I am accustomed to think of a congregation with an organ as I do of a fleet of boats in the harbor, on the waters. The organ is the flood, and the people are the boats; and they are buoyed up and carried along upon its current as boats are borne upon the depths of the sea. So, aside from mere musical reasons, there is this *power* that comes upon people—that encircles them, that fills them, this great, mighty ocean-tone; and it helps them to sing.—*H. W. Beecher.*

I'LL DO MY DUTY.

From "SONGS OF GLADNESS."
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Earnestly.

1. Tho' the clouds are low'r - ing round me, Tho' the storm - wind blow,
2. If with stern re - buke he chide me, And my spir - it chill,

Un - be - liev - ing fears con - found me, On - ward still I'll go.
In the Rock - clefts I will hide me, And a - wait his will.

Chorus.

By his help I'll do my du - ty, Ev - er trust - ing in his word;

rit.

All my care, and ev' - ry bur - den, Cast - ing on the mighty Lord.

While the hailstones cold are falling,
Pelting on my brow,
"Fear thou not!" I hear Him calling,
"I am with thee now." [*Chorus.*

Sainted souls enthroned in glory
Passed along this way;
Bonds and fire and scourgings gory,
Filled up all their day. [*Chorus.*

PUBLISHERS' DEPARTMENT.

Our Acknowledgments.—Orders for subscription come in steadily. Directors especially are subscribing for *The Journal* at this time in the year. Since last list of acknowledgments, orders have been received from County Superintendent T. F. Gahan, Elf H. Shuman, Jas. A. Lowry, J. N. Snider, M. U. Gerhard, W. B. Goodrich, W. T. Morris, H. C. Hickok, W. Keffer, H. N. Amerman, Jos. L. Neff, R. S. Madge, J. H. Harner, Harman Prizer, W. F. Miller, Geo. S. Phillips, S. C. Kirk, E. H. Strawn, R. L. Shirk, Peter Spangler, B. F. Raesley, N. E. Reinhart, J. W. Walker, A. S. Scheetz, M. E. Rowland, H. B. Eastburn, D. C. Landis, Aaron Segner, John McCaffrey, R. M. Magee, A. S. Jamison, J. W. Danenhower, John Daugherty, J. B. Mitchell, M. E. Singard, T. Bodle, Daniel McCurdy, Jos. R. Kendig, D. G. Allen, W. N. Aiken, H. M. Jones, H. S. Kramer, J. W. Kurtz, Wm. McDowell, I. J. Patton, S. D. Morgan, D. E. Kast, S. S. Jack, J. K. Edgar, John Duggan, W. J. Stewart, W. A Campbell, F. S. Cressman, D. K. Wales, J. N. Fradenbaugh, David Leffler, M. L. Knight, Dr. H. M. Raker, John Beatty, Edgar A. Singer, W. J. Foreman, H. S. Hersh, Aaron Sheely, D. G. Allen, D. B. Kraatz, Abram L. Chase, Israel Stone, William M. Fahnestock, A. H. Glasmire, William H. Carpenter, Leroy Bonesteel, Abram L. Line, D. B. Brunner, Thos. Stewart, O. W. Anderson, Thos. L. Gamble, Sam'l H. Calfe, Calvin Parsons, H. Omwake, Samuel Logan, Wm. A. Shaeffer, A. McElwain, H. B. Eastburn, Oscar M. Robins, W G. Lenman, Asbury Derland, Mart. King, T. Bodle, John Hill, Wm. Brown, Geo. W. Supplee, Perry Kidder, James W. Dagen, A. Meachem, Isaac P. Jackson, P. J. Shaffner, Wm. A. Speer, Levi Encker, Sam'l R Crozier, H. Vogan, J. G. Farquaher, Geo. Still, Wm. Gerlach, Isabella F. Worrall, W. J. Burke, S. C. Tussey, E. Kratz, R. A. Lyon, Isaac Ellis, L. B. Liesterberg, A. S. Burrowes, G. L. Maris, A. P. Barney, R. Chadwick, Wm. McCreary and W. T. & C. O. Smith. Thanks to all friends.

During the Past Thirty Days the Excelsior School Desk has been adopted at Reading, Pa., Tamaqua, Pa., Lancaster, Pa., Slatington, Pa, Jersey City, N. J., Woodstown, N. J., Edgemoor, Del. A much larger list could be made out if the record was *carried back six months*.

Notwithstanding the false impressions trying to be made by other school furniture parties, the Excelsior Senior Desk was adopted by the Board of Education of Philadelphia, for use in the senior classes of the schools of that city for the year 1873, and the following buildings have been furnisned with them: Lincoln Grammar School, Rutledge Grammar School, Newton Grammar School, and the Boys' Central High School.

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Institute Instructor.—Prof. Chas. H. Verrill goes to Kingston, Ulster county, N. Y., Sept. 8th, for a two weeks institute; and to Owego, Tioga county, N. Y., Sept. 22d, for another two weeks engagement. After the close of second named institute he will be open to engagements in Pennsylvania.

"Ahead of the Popular Magazines."—Mr. J. Groesbeck, Manager of Crittenden's Commercial College, Philadelphia, writes August 4th: "Allow me to congratulate you on the appearance of your new cover. It is beautiful and attractive, and an index of the refined taste and ability manifested in the conduct of *The Journal*. It ranks in style ahead of our popular magazines, and I heartily wish *The Journal* the great success it so richly deserves."

County Institute.—The meeting of the County Institute of Susquehanna county, Rev. W. C. Tilden, Superintendent, will be held at New Milford, commencing Sept. 1, 1873.

"Letter from Home."—Mr. S. S. Jack writes July 28th: "Enclosed please find amount ($1.50) for subscription to *Journal* for current year. It is like a letter from home and though I am not teaching, I would not like to be without it."

"The Best."—Prof. J. Baldwin, Principal of the Missouri State Normal School, located at Kirksville, Mo., writes July 24th: "I mail you our catalogue, and also a copy of the 'Normal American Journal of Education," which I edit. We *must* have *The Pennsylvania School Journal*. We regard it as the best. We want it both as an exchange and for our reading room."

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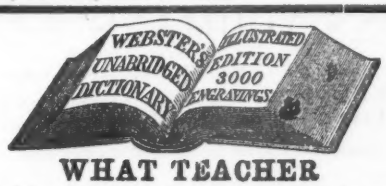
"The Backwoods."—Mr. Israel Stone, Secretary, in a letter of August 8, from Delmar, Tioga county, renewing subscription of his board of directors, remarks. "We can appreciate *The Journal*, although we do live in what is called the backwoods."

"Can't Keep House Without It."—Mr. O. W. Anderson, Secretary, West Springfirld. Erie Co., orders *The Journal* continued to his board of directors, and adds: "They say they can't keep house without it."



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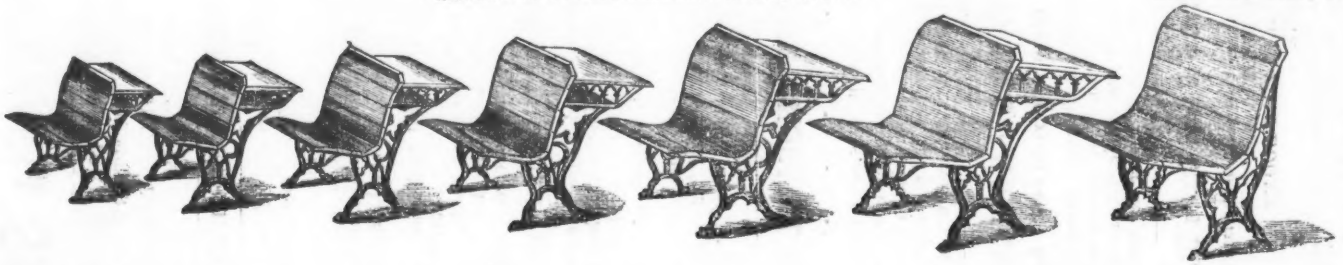

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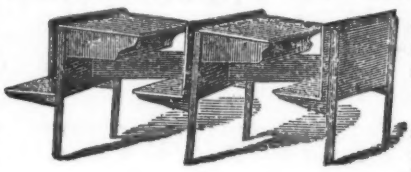

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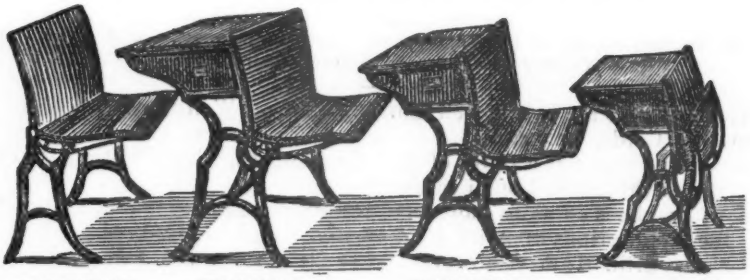

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